Türkiye aşkının kimişesi: Petkim
Tam 52 yıldır.

52 yıl önce Türkiye'nin ilk petrokimya tesisi Petkim kuruluşken hedef Türkiye'nin içi gücü olmaktı. Bugün ürettiğimiz 80 farklı ham madde ile 6000 sanayi kuruluşumuzun üretimine destek veriyor, ekonomimizi sağlam temeller üstünde yükseltmek için var gücümüzle çalışıyoruz.

2,2 milyar dolar piyasa değeri ile Türkiye'nin en büyük şirketlerinden biri olmanın hakkını gururuyla 150.000 kişiye doğrudan ve dolaylı olarak istihdam sağlıyoruz.

52 yıllık deneyimimizle bugün olduğu gibi gelecekte de Türkiye ekonomisinin hep daha iyi ve taşınmasına katkıda bulunmaya devam edeceğiz.
Okyanusları aşan üreticiler,
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1989'dan bu yana, ileri teknoloji cihazlarının satış, servis ve uygulamaları konusunda Türkiye'nin en seçkin kurumlarına hizmet vermekteyiz.
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The Abstracts of the
3rd International Porous and Powder Materials
Symposium and Exhibition
PPM 2017

12-15 September 2017
Kusadasi, Izmir-TURKEY

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FOREWORD

We welcome you to the 3rd International Porous and Powder Materials Symposium and Exhibition, PPM 2017.

The foreword of the proceedings and the abstracts books of the first PPM started with the following sentence: ‘Idea of organizing a symposium on porous and powder materials owes its germination to the curiosity about the “other side of the fence”.’

It was a very fitting and almost a prophetic statement because the previous two symposia (PPM 2013 and PPM 2015) both gathered over 600 participants from around 50 countries with an surprisingly wide spectrum of science and technology, who one way or another dealt with porous and powder materials. Such a gathering was a testament to the fact that we actually all deal with the same basic questions when we truly try to understand a process or a material no matter where it is developed or being put into use.

PPM 2017 follows this very basic premise and aims to focus on and amplify the interconnection among different fields of science and technology related to porous and powder materials and turn it into a fruitful interaction while creating a familiarity for the work of each other. With this in mind, the main themes of the symposium were kept the same:

Theme A: Development and Characterization
Theme B: Catalysis
Theme C: Environment and Energy
Theme D: Biological and Medical Aspects
Theme E: Transport and Surface Chemistry
Theme F: Modeling and Simulation
Theme G: Industrial Applications

The foreword for PPM 2013 ended with the following sentence: ‘We believe that this healthy curiosity (about what is happening beyond the fence) will make the International Porous and Powder Materials Symposium and Exhibition a regular and respected gathering in the field for the years to come.’ The abstract and proceedings books of the PPM 2017 are proof that we are getting closer to what we have aspired.

We would like to take this opportunity to extend our sincere appreciation to all symposium participants, our invited speakers, session chairs, Advisory Boards, Exhibitors and Sponsors who have all contributed to make this possible.

With our best regards we hope to get together in PPM 2019 in both senses of the word.

On behalf of the PPM Organizing Committee,
Mehmet Polat and Metin Tanoglu, Symposium Chairs
Ozlem Caglar Duvvarci, Symposium Secretary
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Nano-composite Particle Enhanced Photo-catalytic Activity within Visible Light Range
Asena Cerhan, G. Bahar Basim
Email: bahar.basim@ozyegin.edu.tr

Photocatalysis is simply defined as the decomposition of organic and harmful matter on textile surface through an oxidation reaction of inorganic substances as light (as a catalyst) accelerates the reaction. However, most of these studies are inadequate for daily usage due to the limited efficiency of the photocatalytic activity under the visible light. In this study, synthesis and characterization of polymer/titania composite photocatalytic particles are discussed in addition to the evaluation of their activity on the textiles. TiO2 is known to be a compatible photocatalytic material for application on textiles. Anatase, a crystalline form of TiO2, however, is known to be very prone to agglomeration making it challenging to be used for textile coating applications. In this study, a textile blend of 65% cotton and 35% PES is selected for the experiments as a widely used blend of sports outfits. Anatase solutions were prepared in a commonly utilized hydrophobic finishing solution. Composite nanoparticles were synthesized with a layer of polymer branch on their surface. The dip-coating method was chosen for fabrication of textiles with a padding machine. Coated textiles were characterized for self-cleaning textile production to evaluate the effectiveness of photocatalysis and the conformity to use in visible range as a market product.

Keywords: Photo-catalysis, self-cleaning textiles, synthesized branched silica, technological textiles

A Comparative Dry Grinding Study of a Natural and a Heated Vermiculite
İlhan Ehsani, Nurettin Alper Toprak, Okay Altun, Ayşe Üçyıldız, Abdullah Obut
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In this study, dry grinding behaviour of a natural vermiculite sample and its heated counterpart in a laboratory ball mill was investigated using particle size analyses, surface area measurements and X-ray diffraction analyses. The particle size analyses performed on ground powders indicated that the natural and heated samples exhibited different grinding behaviours with respect to grinding time. Although the heated sample had a coarser size distribution than the natural sample due to expansion caused by initial heating process, heated sample ground for only 5 minutes had a finer size distribution than natural sample ground for 20 minutes. Also, the natural sample had a lower reduction ratio value of 1.55 after 20 minutes of grinding, which was 6.57 for the heated sample. These findings indicated that the initial heating process made heated vermiculite sample more brittle and easier to grind. As expected, with the increase in duration of grinding, surface area values of both samples were increased, but the increase in surface area with respect to its initial value after 20 minutes of grinding was higher for the natural sample when compared to the heated sample, probably due to its uncollapsed and hydrated layer structure which was prone to cleavage than the collapsed mica-like clay layers. Finally, it was seen that conventional ball milling cannot destroy the layered vermiculite structure and only created very small changes in X-ray diffraction patterns of both samples.

Keywords: Ball mill. Clay. Dry grinding. Fine Grinding. Vermiculite.
Monitoring of Organic Pollutants by Use of Passive Samplers in Marine Environment

Oya OKAY, Atilla YILMAZ, Burak KARACIK, Sevil Deniz YAKAN DÜNDAR, Karl-Werner Schramm
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Several monophasic and biphasic passive sampling devices have been developed for monitoring of hydrophobic compounds in aquatic environments. The conventional sampling methods require high volumes of water sampling and cannot be accurately analysed due to the low detection limits. Passive samplers overcome these difficulties by accumulating the pollutants over time and therefore, they have been frequently used in monitoring studies. Semi permeable membrane devices (SPMDs) are biphasic systems and at present, they are the only standardised and commercially available passive samplers. They contain triolein in a low density polyethylene tubing. Buty rubber (BR) sorbents (macroporous polymeric material-monophasic) prepared via cryogelation technique for the removal of oil spill from waters were tested to be used as passive samplers together with SPMDs in the coastal waters. Polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) were monitored in the passive samplers deployed to the sampling stations for 30 days. Total PAH concentrations in SPMDs were higher than the concentrations in BRs. However, BR sorbents were able to sample some higher molecular weight PAHs which could not be sampled by SPMDs. On the other hand, the concentrations of PCBs and OCPs in BRs were similar or higher than SPMDs.

Keywords: Passive samplers; pollution monitoring; butyl rubber

Dielectric ceramic of steatite starting from Algerian clay

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Dielectrics ceramics steatite based are elaborated by using an Algerian palygorskite. This clay has a high amount of limestone and dolomite (> 40%), therefore, to eliminate these carbonaceous materials, dilute hydrochloric acid is added to a clay slurry, until the end of the effervescences which are produced by the release of carbon dioxide. The slurry obtained is left to stand until the clay is completely decanted, then the clear water is evacuated and again distilled water is added and then the mixture is strongly shaken. This is repeated until a neutral (pH=7). This treatment permits to removes more than 99 % of limestone. Powder which is obtained from the slurry of palygorskite is mixed with precipitated hydroxide magnesium to give starting mixtures. Then pastilles of powder were compacted by uniaxial pressing, and sintered to give ceramics. Simultaneous thermal analysis (Netzsch STA 409 PC) is used to investigate the thermal transformations of mixtures. XRD analysis is used to determine the crystallized phases and the XRF analysis to determine the chemical compositions of starting mixtures. Physical characteristics such bulk and specific densities open and closed porosities and water absorption values of ceramics were measured by normalized method (ASTM C373). Microstructural observations were performed by using Scanning Electronic Microscope. Thermal expansion coefficient (CTE) measurements were carried out by a dilatometer (Netzsch DIL 402 C). The Dielectrics characteristics at various frequencies are determine by using LCR meter.

Keywords: steatite, ceramic, palygorskite, dielectrics characterisation
Photosynthesis; Miracle of Organic Life and Related Technologies
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Photochemical reaction carbon dioxide, nitrogen and water in our atmosphere, producing amino acids, following protein molecular structures, finally creation of micro-living species, and the birth of plants, animals! These microscopic molecular structures (in rivers, lakes, seas) had given birth to moss on land, further all sorts of plants, animals and human beings, that is called as the Miracle of Universe. \[ hν 6n \text{CO}_2 + 6n \text{H}_2\text{O} \rightarrow (\text{C}_6\text{H}_12\text{O}_6)n + \text{O}_2 + \text{ısı} \quad (Δ\text{E}) \]

Consumption of fossil fuels over millennia, now had given birth to atmospheric enhancement of heat, variation of seasons and exhaustion of limited energy sources. As a result, conversion of solar energy into electricity is now a most attractive technology. As known, miracle of photosynthesis, provides the energy needs of all living species on our Earth.1,2 On the other hand, in last quarter of century, Organic Photo-Electronic Technologies of OLED, OFET, OPV, entered rapidly to our daily life.3-5 A distinct example is OLED-Orgamic LED lamps. Mobile phones, Lap-Top Computers, colored TVs e.t.c. were based on OLED technology. Of course, these developments on Organic Technologies, are steps to adaption of human kind into nature, leaving the emoployment of steel, iron and birghtons our future centuries.1 The OLEDs and flowing the OPV-Organic Photo Voltaics and OFET-Organic Field Effect Transistors, entering into all of our elektronic systems, capable us compatability of our technological systems-tools into nature, and our Earth will not be threatend by poisonous waste problems, our running waters will be drinkable-washable. Keywords: Photosynthesis, Organic Photo-Electronic Technologies, OPV, OLED, OFET.

Acknowledgements: My sincere thanks to Alexander von Humboldt Foundation of Germany for the supports.

Keywords: Photosynthesis, Organic Photo-Electronic Technologies, OPV, OLED, OFET

Anisotropic Mechanical Behaviour of Direct Metal Laser Sintering (DMLS) Parts
Zafer Çağatay Öter, Mert Coşkun, Ebubekir Koç
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This paper presents the experimental work carried out in order to reveal the anisotropic mechanical behavior of the additive manufacturing parts introduced by the building direction in Direct Metal Laser Sintering (DMLS). DMLS is a selective laser sintering (SLS) method based on fine layers of powder materials being fused by high energy laser energy to create metallic parts. In this technique, a solid layer is formed directly from the data in the CAD drawings of the parts to be produced by partially melting and sintering the metal powders using a focused high energy laser at the appropriate points to form the part geometry. Standard tension test specimens were produced using EOS M290 in three different building directions. Specimens were then separated into two groups: As-built and heat treated. Tension tests were carried out according to TS EN ISO 6892-1 standard. Tensile and yield strength of each sample were calculated. Fracture surfaces were characterized using Scanning Electron Microscope (SEM). Results revealed that building direction has a significant effect on the mechanical properties of DMLS parts.

Keywords: Anisotropic Mechanical Behavior, Building Direction, Additive Manufacturing, Selective Laser Sintering, Direct Metal Laser Sintering
Chemical Mechanical Planarization (CMP) is a widely used process for the manufacturing of the microelectronic circuits. It is common to planarize the metallic layers such as tungsten in the transistor via and copper in the metallization lines. The integration of the metallization also involves the deposition of the barrier layers, which are necessary to stop the diffusion of metal to the transistor as well as to improve the adhesion of the metal to the underlying layers. In this study, titanium barrier CMP was thoroughly studied by electrochemical analyses with respect to the tungsten metal itself. Ti has the unique ability to form a protective oxide layer, which was characterized and analyzed under different oxidizer concentrations. Potentiodynamic and potentiostatic scans were performed in H2O2 to provide more information on the passivation and corrosion behavior under the selected conditions. It was observed that the higher the oxidizer concentration the faster is the passivation rate and that the corrosion rates increase up to a point where the behavior of the oxide film changes. Moreover, the effect of slurry solid loading in relation with oxidizer concentrations on the film formation and removal during the CMP was investigated. The application of corrosion behavior of Ti as a barrier material for W based interconnects was further studied by evaluating the surface energy, roughness and topography analyses.

**Keywords:** CMP, Electrochemical Analyses, Titanium Barrier, Ti Passivation, Corrosion, Potentiodynamic and Potentiostatic Scan

The microfiltration of the ceramic industries effluents by ceramic membrane filters for the recycling or environmentally safe discharge may provide a feasible alternative to the chemical and biological sedimentation processes. In this study, actual ceramic industries effluents were filtered through ceramic tubular microfilter membranes of 15 mm inner diameter and 200 mm long. The wastewater samples were obtained from tableware and ceramic tile production plants. The filter supports were made from α-Al2O3 (4 μm) by extrusion and sintering at 1525°C. The microfilters were fabricated by the impregnating coating of the inner surface of the supports with α-Al2O3 (0.5 μm) particulate sol-gel process followed by heat treatment at 1200°C. The suspended solids (SS), chemical oxygen demand (COD) and electrical conductivity (EC) loadings of the effluents of 8000 mg/L, 2500 mg/L and 2000 μS/cm were reduced to 1 mg/L, 100 mg/L, 600 μS/cm with the support, and 0 mg/L, 90 mg/L and 400 μS/cm with the microfilter, respectively. The SS, COD, and EC of the filtrates all decreased with increasing cross membrane pressure from 2 bars to 6 bars. The chemical nature of the loading rather than the particle size was determined as the major parameter affecting the fouling of the membranes.

**Keywords:** Ceramic plant effluent, ceramic membrane filter, microfiltration, wastewater treatment
A New Porous Azo-functionalised Zn(II)-Organic Framework
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Porous materials attached much attention thanks to the need of novel adsorbent materials for energy industries around the world [1]. Metal-organic frameworks (MOFs) are a new class of porous material, consisting of metal ions linked together by organic linkers [2,3]. Many efforts have been carried out to obtain a range of MOFs with superior properties by using different linkers and metal centers. In our study, we report the solvothermal syntheses, crystal structures of a novel 3D azo-functionalised metal-organic framework of [\(\text{[Zn}_4(\mu_8\text{-abtc})_2(4\text{-bpdb})]\cdot x\text{Solvent}]\) (1); abtc, 3,3',5,5'-azobenzenetetracarboxylate; 4-bpdb = 1,4-bis(4-pyridyl)-2,3-diaza-1,3-butadiene (Fig 1.). The new MOF was characterized by elemental analysis, FT-IR spectra, photoluminescence, thermal analysis and single crystal X-ray diffraction. Complex 1 was synthesized by the reaction of \(\text{Zn(NO}_3)_2\cdot x\text{H}_2\text{O}, \text{abtcH}_4, \text{and 4-bpdb ligands. Complex 1 crystallize in the triclinic system with the space group P-1. There are two Zn(II) ion, one abtc anion, half 4-bpdb ligand, and solvent molecules in the asymmetric unit of complex 1. A pair of Zn(II) ions is connected by carboxylate oxygen atoms to form paddle-wheel SBUs with Zn--Zn distances of 3.37 Å. Each SBU is connected by three different abtc and 4-bpdc ligands to form a 3D porous framework. Topologically, complex 1 has 3, 3, 3-topology, fcu/cubic topology with the point symbol of \{62·87·10\}{62·8\}2. Fig 1. 3D Porous structure of complex 1 References [1] Adv. Funct. Mater. 2012, 22, 4634–4667 [2] Inorg. Chem., 2015, 54 (23), 11283–11291 [3] Chem.Rev. 2012, 112, 1105–1125.

Keywords: metal organic frameworks, coordination polymers, solvothermal synthesis, topology analysis,
ID 23

Synthesis, Characterisation and Application of New Zeolite-Based Sorbents for Solid Phase Extraction

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Zeolites are microporous aluminosilicates with large surface areas and well-defined pore structures of uniform cages, cavities or channels. They are widely used as catalysts and sorbents. Solid phase extraction (SPE) sorbents are capable of selective recognition of interested analytes in sample. In this study we synthesised zeolite-based materials for separation and isolation of sterols and tocopherols in sunflower oil deodorizer distillate (SuDOD). The main novelty of this work is designing SPE cartridges with dealuminated zeolites (X and A type) have three different Si/Al ratios ranging from 0.8 to 1008. Effects of dealumination conditions on Si/Al ratios were searched using different parameters such as type of catalysts (HCl, KOH), temperatures (80, 110, 150°C) concentrations (0.5, 1, 2N, 4N) and times (6, 15, 24 hours). The structures and Si/Al ratios of the materials were investigated using NMR, XRD and FTIR spectroscopy. Particle size of materials were measured between 59 and 119 nm by DLS. Volume of eluent, sample volume, amount of sorbent, flow rate were examined for optimization of SPE procedures. After SPE packing optimization, cartridges were applied to SuDOD for separation and isolation of sterols and tocopherols. In order to determine the performance of the extraction method validation parameters were studied.

Keywords: zeolite, dealumination, sorbent, solid phase extraction

ID 24

Chromatographic Separation of Boron from Geothermal Water using a Boron Selective Chelating Fiber Adsorbent

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Direct release of geothermal waters to the environment may cause some damages to plants because they contain some toxic species such as boron, arsenic, fluoride etc. Although boron is essential for some metabolic activities of plants, there is a small range between boron deficiency and boron toxicity. WHO currently recommends a limit as 1.0 mg B/L for irrigation water. The development of functional chelating materials with large capacity, high selectivity and high sorption rate is still needed for boron removal from aqueous media. In this study, the performance of the novel boron selective chelating fiber adsorbent containing N-methyl-D-glucamine type functional group, Chelest Fiber GRY-HW, was investigated for boron removal from geothermal water containing 10-11 mg B/L by chromatographic separation method. The effect of feed flow rate (Space Velocity, SV) on breakthrough capacity of Chelest Fiber GRY-HW was studied using various SV values (15, 20 and 30 h⁻¹). The effect of SV on breakthrough capacity was particularly apparent when SV was decreased from 30 to 15 h⁻¹. According to the results obtained, breakthrough and total capacities of Chelest Fiber GRY-HW were found to be 7.3 and 13.5 mg/g-fiber, respectively at SV of 15 h⁻¹. A 89% of elution efficiency was obtained when 5% H2SO4 solution was employed as eluting agent. Thus, Chelest Fiber GRY-HW can be utilized as an alternative adsorbent for chromatographic separation of boron from geothermal water.

Keywords: Boron, chromatographic separation, fiber adsorbent, geothermal water, N-methyl-D-glucamine (NMDG)
Material Removal Rate Improvement for GaN through Cost Effective CMP Process
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Gallium Nitride (GaN) is a key electronic material for high-power and high-frequency devices. It is widely used for light emitting diode (LED) applications due to its wide direct band gap, high power adoptability and high thermal stability. Although it is necessary to planarize the GaN surface for LED applications, it is challenging to polish and planarize GaN because of its chemical inertness and mechanical hardness. Mechanical polishing applications result in limited removal rates and unacceptable surface quality and hence chemical component is required to enable smooth surface finish and optimal material removal rates.

This paper focuses on the optimization of chemical mechanical planarization (CMP) process of GaN in terms of material removal rate, by tuning the slurry chemistry and CMP tool design to a new slurry formulation implementation. It was observed that GaN CMP is affected by the chemical component as well as the order of chemical addition, which ID significantly contribute to enhanced material removal rates while providing better surface quality. Optimization of applied force, pad type, slurry flow rate, slurry solids loading and temperature are also evaluated for optimization of the CMP process for the GaN planarization applications.

Keywords: GaN CMP, slurry chemistry control, new polisher design

On The Interactions Of Surface Reactions And Multicomponent Flow In A Nitriding Process
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Interactions of surface reactions and the multi-component, chemically reacting flow around a load in a nitriding process were described by the spatially-averaged Navier Stokes equations and the transport equations for 17 scalars. Surface reactions were modeled with 12 reactions and 11 species, including gas (“N” “H” “3”, “H” “2” ”” and “N” “2” ) and surface species (“N” “H” “3ad”, “N” “H” “2ad”, “N” “H” “ad”, “N” “2ad”, “H” “2ad”, “N” “ad”, “H” “ad” and “SUR”, the latter representing the surface). The flow modeling was matched with an in-service furnace with 16 baskets of loads, and the domain was discretized in 13.5 million cells. The study revealed both macro- and micro features of the flow inside the system as well as in and around the individual parts. It was clear that the cross-stream frequently separated and formed Karman-like vortices downstream of the parts. This further destabilized the flow and resulted in spatial variations in the ammonia depletion and the formation of nascent nitrogen coverages over the parts. The flow features also showed that the reactivity on the surface well correlates with the time scale associated with the local turbulence.

Keywords: Nitriding Process, Surface Chemistry, Reacting Flows, CFD
In this study, the mechanical and tribological effects of Zirkonium dioxide (ZrO2) reinforcement in Aluminium (Al) powder metal compacts are investigated. Aluminium composites consist of 99.8% pure aluminium reinforced with five different portions of ZrO2. Aluminium powders was mixed with ZrO2 by ball milling for 30 min in a planetary mixer. The powder mixtures are compacted by the cold pressing technique at 250 MPa. Two different methods are used for sintering application which are conventional sintering and induction sintering are given respectively. On the one hand, the aluminum based powder compacts are sintered with conventional furnace at 600°C for 30 minutes. On the other hand, other aluminum based powder compacts are sintered with 900 kHz Ultra-High Frequency Induction Heated System (UHFIHS) in open atmosphere. The mechanical and microstructural properties of examples are compared each other. Maximum hardness result has been observed for 5 wt. % ZrO2 reinforced composites.

Keywords: Aluminium, ZrO2, conventional sintering, Induction Sintering, Powder Metallurgy.

Synthesis and Structure–Property Relationships of Cryogels

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Hydrogels belong to the most important class of functional polymers in modern biotechnology. Despite their various application areas, design of hydrogel-based devices presents problems due to their poor mechanical properties. Cryogelation technique overcomes these limitations by generating macroporous gels with high toughness and superfast responsivity [1-3]. In this talk, I will discuss how and why the properties of gels significantly alter upon transition from homogeneous gelation to cryogelation regime. The formation and properties of cryogels starting from monomers as well as from linear polymers are discussed using examples from our recent works. These include DNA cryogels for the removal of carcinogens from aqueous environment, silk fibroin cryogels as mechanically strong scaffolds for tissue engineering applications, poly(acrylic acid) cryogels as self-oscillation systems and rubber cryogels as reusable oil sorbent for the removal of oil spill from seawater. References: 1) O. Okay, V. I. Lozinsky, Adv. Polym. Sci. 263, 103-157 (2014) 2) V. I. Lozinsky, O. Okay, Adv. Polym. Sci. 263, 49-101 (2014)

Keywords: cryogels, macroporous materials
The Effect of Carbonization Temperature, Carbonization Time and Impregnation Ratio on The Properties of Activated Carbon Produced from Arundo Donax

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Activated carbon has a high carbon content, and it is highly porous adsorptive medium with a complex structure. Therefore, activated carbon is widely used for contaminant removals and different adsorption applications. In this study, production parameters; carbonization temperature, carbonization time, and impregnation ratio were changed to investigate their effects on activated carbon produced from Arundo donax by chemical activation with zinc chloride. BET surface areas, pore volumes, pore distributions, and N2 adsorption-desorption isotherms of these activated carbons obtained were measured by using Micromeritics Tri-Star II 3020, in which Brunauer–Emmett–Teller (BET) model and DFT method were applied to the isotherm data and micropore volumes were estimated using t-plot method. Furthermore, the results of FTIR spectra, SEM analysis, elemental analysis, Boehm titration, and point of zero charge (pHPZC) were used for the characterizations of activated carbons obtained.

Keywords: Arundo donax, activated carbon, chemical activation, pore distribution, characterization, spectroscopy

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Acid Effect On The Porosity And Surface Area Of Activated Carbon Prepared From Arundo Donax By Chemical Activation

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In the chemical activation method, high surface area activated carbon is obtained, which finds a specific application area [1]. In this work, activated carbons were prepared from Arundo donax by treating in sulfuric acid solutions with different concentrations and then carbonization at 600 °C for 1 h. The calculations of their BET surface areas, micropore volumes, mesopore volumes, pore distributions, adsorption average pore widths (4V/A by BET) and N2 adsorption-desorption isotherms were carried out by means of Micromeritics Tri-Star II 3020. Also, activated carbons were characterized by using Fourier transform infrared spectroscopy (FTIR), scanning electron microscope (SEM), and elemental analysis.


Keywords: Arundo donax, activated carbon, acid activation, pore distribution, spectroscopy
Additively manufactured implants and biomaterials
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Additive manufacturing (AM = 3D printing) has emerged as a powerful tool for fabrication of implants and biomaterials with advanced and sometimes unprecedented functionalities. There has therefore been intensive research during the last few years on how AM technologies could be best exploited for development of innovative implants and biomaterials. In this talk, I will present some of the latest innovations resulting from such efforts with a focus on what my lab has been developing for treatment of large bony defects and other skeletal diseases. Moreover, the validation studies that have been conducted to evaluate the performance of the developed implants will be discussed.

ID 31
Silk Fibroin Scaffolds with Anisotropic Mechanical Properties
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Many biological tissues including muscles, tendon and cartilage possess anisotropic hierarchical morphologies, that are not observed in synthetic biomaterials such as hydrogels which are chemically or physically cross-linked polymeric materials. For biomedical applications, it is important to fabricate biomaterials possessing anisotropic hierarchical morphologies like biological tissues. Polymeric gels are unique soft materials for tissue engineering applications owing to their softness, smartness and similarity to biological tissues. In order to prepare gels with anisotropic properties, various strategies have been used including directional freezing, strain-induced reorientation and 3D printing. Among these techniques, directional freezing is a simple and promising one to the preparation of aligned porous materials. However, materials prepared by directional freezing technique generally exhibit poor mechanical properties limiting their application areas. In this study, cryogelation technique providing formation of mechanically strong macroporous networks is combined with the directional freezing technique to fabricate mechanically strong, biodegradable and biocompatible silk fibroin scaffolds with anisotropic mechanical properties. The prepared scaffolds exhibit anisotropic hierarchical morphologies and thus anisotropic mechanical properties, e.g., the Young’s modulus is 3.4 ± 0.5 MPa and 0.8 ± 0.3 MPa when measured along the directions parallel and vertical to the freezing direction, respectively.

Keywords: Hydrogel, Cryogel, Silk Fibroin
Laser ablation process is a developing method to produce nanoparticles ablated from bulk materials. While Nd:YAG is a commonly used laser source for this technique, MOPA fiber which is cheaper and faster than Nd:YAG laser is used first time to produce Ag nanoparticles. Besides several production parameters, Ag nanoparticles are produced in deionized water by only changing scanning time as a production parameter. According to the powder size distribution results it is found that increasing scanning time reduced the powder size to 3 nm. The morphology of the powders are obtained by SEM and EDS analysis are carried to proof the nanopowders are pure Ag.

Keywords: Ag, nanoparticle, laser ablation, fiber laser

In this study, 316L powders are compacted at 600MPa, 750MPa and 900 MPa respectively. As compacted powders are sintered by microwave and conventionally at 1250 C for 30 min under inert atmosphere. Microstructural evaluations are obtained by SEM for sintered compacts. Volume change and porosity levels are obtained to understand the sintering mechanism. Additionally, 3 point bending tests are done for the comparision of mechanical properties. Broken surfaces are also observed by SEM to understand the cracking mechanism. As a general result, bending strength is nearly 50% higher by increasing pressure from 600 MPa to 900 MPa for both sintering methods. It is also found that microwave sintered 316L compacts have nearly 50% higher bending strength than conventionally sintered ones which are compacted at 900 MPa.

Keywords: 316L, powder metallurgy, microwave sintering
ID 35

Analysis of Comparative Energy Consumption of An Ultra-High Frequency Induction Heating System for T6 Heat Treatment Applied To The Al-Cu Powder Metal Compacts

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This work compares an energy cost and an energy consumption results of the 3 wt.% copper mixed aluminum based powder metal (PM) compacts processing under induction or furnace heating. Total power and energy consumptions and total energy costs per kilogram and compact have been analyzed. T6 precipitation heat treatment applications have been applied with two different methods, one with 2.8 kW, 900 kHz ultra-high frequency induction system, other with 2kW chamber furnace. In the first method, Al-Cu PM compacts have been heated by induction at 580 °C in one minute and then cooled down by water. Afterwards, the samples have been heated 170 °C, 180 °C, 190 °C and 200 °C respectively for artificial ageing and cooled naturally. In the second treatment, unlike the first study, Al-Cu PM compacts are heated by chamber furnace at 540 °C in 5 hours and cooled by water. Then PM compacts are artificially aged at 190 °C in 10 hours with same furnace. During both processes, energy and power consumptions for each defined process have been measured. Optimum heat treatment of the induction is determined. The cheaper energy cost is obtained by the induction heat treatment.

Keywords: Heat treatment, Aluminum, powder metal, induction heating, energy cost, energy consumption.

ID 36

Energy Consumption Analysis of The Ultra-High Frequency Induction Sintering Parameters of Pure Aluminum PM Compacts

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In our study, pure aluminum (Al) powder metal (PM) compacts are sintered two different sintering method. One of them is conventional sintering, other one is induction sintering. In the conventional sintering process, PM compacts are sintered by furnace at 600 °C in 30 minutes. In the other sintering process, PM compacts are sintered by induction system at 600 °C in six various dwell time from 1 to 10 minutes. 2.8 kW, 900 kHz (UHFHS) ultra-high frequency induction heating system used for heating application of induction sintering process. Densities and hardness values are investigated for both processes. During these sintering processes, all energy consumption results are measured and calculated, than compared with each other. The effects of the dwell time increase in the induction sintering process on energy cost has been analyzed. Optimum dwell time of the induction sintering process is determined. It has been seen that the cheaper energy cost is obtained by the induction system for sintering application.

Keywords: Induction sintering, conventional sintering, aluminum, PM, energy cost, energy consumption.
**ID 37**

**In Vitro Properties Of Forsterite-Based Porous Coatings Produced On Az31 Mg By Micro Arc Oxidation**

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AZ31 Mg alloy produced by twin roll casting was coated by micro arc oxidation (MAO) in solutions, consisting of 4 g/L Na2SiO3.5H2O + 1.5 g/L KOH (S1) and 8 g/L Na2SiO3.5H2O + 1.5 g/L KOH (S2) electrolytes at 0.140 A/cm² for 45 min. The phase structure, surface and cross sectional morphology, elemental composition, thickness and roughness of the coatings were characterized by XRD, SEM, EDS, eddy current method and surface profilometer, respectively. The XRD results indicated that Mg2SiO4 (Forsterite) and MgO (Periclase) phases were formed on the surface after MAO. In vitro properties (bioactivity and biocompatibility) of the coatings were analyzed by immersion test in SBF and MTT assay, hemolysis assay and bacterial formation. The apatite-forming abilities of the coatings and substrate were evaluated after immersion in SBF up to 14 days. After immersion, apatite structure was formed on the forsterite-based surface and bioactivity of MAO surfaces on AZ31 Mg was significantly improved under SBF conditions. Moreover, the apatite structure was observed on the surface of uncoated AZ31 Mg. The bacterial adhesion of the coatings significantly was reduced with increasing sodium silicate concentration due to the decreasing of surface roughness. The hemocompatibility of the forsterite-based surfaces was improved by MAO.

**Keywords:** In vitro; apatite; micro arc oxidation (MAO); Twin roll cast (TRC) AZ31 Mg; bioactivity; biocompatibility.

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**ID 40**

**Preparation And Characterization of Magnetic Porous Polymer Microbeads by Suspension Polymerization**

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In recently, magnetic beads are currently enjoying a fairly ample range of applications in many fields including among others biotechnology, nanotechnology, biochemistry, colloid sciences and medicine [1]. The impregnation of magnetism is usually achieved by combination of magnetic components into adsorbents, which are mainly Fe3O4-based substances [2]. In this study, the Fe3O4 nano-powder containing magnetic poly(ethylene glycol dimethacrylate-1-vinylimidazole) [m-poly(EGDMA-VIM)] microbeads were prepared by copolymerizing ethylene glycol dimethacrylate (EGDMA) with n-vinyl imidazole (VIM). The [m-poly(EGDMA-VIM)] microbeads were characterized by N2 adsorption/desorption isotherms, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), thermal gravimetric analysis (TGA), elemental analysis, scanning electron microscope (SEM), transmission electron microscope (TEM), vibrating sample magnetometer (VSM), zeta potential measurements and swelling studies. The specific surface area of the [m-poly(EGDMA-VIM)] microbeads was found to be 278.6 m²/g with a size range of 5–150 m in diameter and the swelling ratio was 48%. The approximate IEP value for the [m-poly(EGDMA-VIM)] microbeads was at pH 2.9. SEM image of the [m-poly(EGDMA-VIM)] microbeads are presented in Figure 1.

**Keywords:** Magnetic microbeads, Suspension polymerization, Porous materials
ID 41

**Microstructure Features and Mechanical Properties of Al Matrix Nanocomposite Reinforced by Nano-And Micron Sized Al2o3 Particulates Developed by Spark Plasma Sintering**

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Aluminium matrix nanocomposite reinforced by two sizes of Al2O3 particles (80nm and 25µm) are first mixed by ball milling and then sintered by spark plasma sintering processes. The effect of ratio the nano- to micron- sized particle on microstructure and nano-indentation is evaluated. A strong variation in the microstructural behaviour and in mechanical properties has been observed by varying the percentage of nano to micron sized alumina particles blended with aluminum ones. It is found that the ratio of the nano to micron sized Al2O3 particles has a significant role for attaining to optimum properties. The results are shown that by increasing the nanoparticles content till lower than 4 wt%, the nano-hardness and ultimate strength values of the nanocomposite first increase and then decrease for content of higher than 4 wt%. The microstructure analysis of Al-Al2O3 nanocomposite with bimodal sized of Al2O3 particles revealed a grain refinement processes of Al particles as well a homogeneous distribution of nano and micron sized Al2O3 particulates within aluminium matrix.

**Keywords:** nanocomposite, ball milling, spark plasma sintering

ID 45

**Sonocatalytic Activity Of SiO2/CeO2 Core/Shell Particles**

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The aim of the study is to evaluate the availability of the removal of pollutants found in waste water with the help of ultrasound and by using CeO2 coated SiO2 nanoparticles as catalysts. For preparing catalyst structures, primarily SiO2 nanoparticles were prepared by Stöber method and characterized. CeO2 was integrated on the surface of the SiO2 nanoparticles by using solvothermal method. XRD, SEM, FTIR-ATR and N2 adsorption studies was performed to determine the characteristics of the structure of catalyst. As a result of characterization, it was observed that the metal coating on surface of the support was achieved successfully. Rhodamine-B which has high oxidation resistance and low light transmittance even at low concentration in solution was used as a model contaminant. Catalytic activity studies were performed in batch system by using ultrasonic bath (Bandelin electronic RK 255H, Germany) at 35 kHz and 160W. The result of the experiments showed that the CeO2 coating increased the degradation ratio Rhodamine B with respect to the uncoated SiO2 particles and ultrasound alone. The degradation ratio of Rhodamine B was found as 25.4%; 29.8% and 49.7%; for only ultrasound, SiO2 nanoparticles and CeO2/SiO2 core/shell particles used experiments, respectively.

**Keywords:** sonocatalysts; CeO2; core/shell particles; Rhodamine B
The Utilization of Ceramic Tubular Micro, Ultra and Nano-Membranes in the Phenolic Resin Contaminated Wastewater Management

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The micro, ultra and nano filtration of the phenolic resin incorporating effluents by ceramic membrane filters for the recycling or environmentally safe discharge may provide a feasible alternative to the chemical and biological sedimentation processes. In this study, the effluent of a phenolic resin producing process were simulated by preparing phenolic resin solutions in the 500 ppm to 50 ppm range, and filtered through ceramic tubular micro, nano and ultra-filter membranes of 15 mm inner diameter and 200 mm long. The filter supports were made from α-Al2O3 (4 μm) by extrusion and sintering at 1525°C. The micro, ultra and nano filter layers were fabricated by the impregnating coating of the inner surface of the supports with α-Al2O3 particulate sol (0.5 μm), boehmite (42 nm), titania/zirconia sol (18 nm), and neodymium doped titania/zirconia sol (4 nm) sol-gel process followed by heat treatment at 1200°C. The phenolic resin content were determined by the chemical oxygen demand (COD) and UV absorbance measurements of the simulated effluents. The concentration was reduced to 100 ppm by microfiltration, while ultrafiltration yielded outputs with concentration below 50 ppm. The COD and concentration of the filtrates decreased with increasing cross membrane pressure from 2 bars to 6 bars.

Keywords: Phenolic resin, ceramic membrane filter, microfiltration, wastewater treatment

Supercapacitor Performance of The Activated Carbons Produced From Waste Tea and Lignite Mixtures

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The aim of this study is to investigate the performance of activated carbons developed from the mixture of waste tea (WT) and lignite coal by microwave induced H3PO4 activation as supercapacitor electrodes. The activated carbons were prepared by using the WT/Lignite weight ratio of 50:50 and 25:75. The surface properties of the activated carbons were characterized by N2 adsorption-desorption, BET surface area, elemental, FTIR, SEM analyses techniques. The electrochemical performance of the activated carbon electrodes was examined by cyclic voltammetry, electrochemical impedance spectroscopy and galvanostatic charge/discharge techniques in an aqueous electrolyte. It is concluded that using waste and lignite mixture as the raw material leads to a significant change in the physical and chemical structures of the products. The surface area and the total pore volume values of the samples produced from the WT-lignite mixture are much lower than the WT based sample. Depending on the increase in the amount of lignite in the raw material, the micropore volume of the products increased from 28.98 % to 48.21 %. On the other hand, the amount of lignite directly affects the amount of nitrogen, oxygen, and sulphur in the product. The electrochemical analyses results showed that the electrodes produced from the mixture of WT-lignite represented better performance than WT based carbon electrodes despite their lower specific surface area and total pore volume. Moreover, the chemical composition of the activated carbon has a substantial effect on the performance of the electrode. The internal resistance of the electrodes developed from WT-lignite mixtures is lower than the WT based activated carbon. This may be related to their well-balanced micro/mesoporous structure and the presence of the nitrogen and sulphur containing functional groups leading an increase in the conductivity of the electrodes.

Keywords: Supercapacitors, activated carbons, lignite, porous structure, surface functionality
ID 58

Acidic Dye Adsorption From Aqueous Solution Using Chitosan-Based Composite

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Orange II is an anionic azo dye that is extensively used in textile, soaps, inks, cosmetics etc. Orange II is a toxic dye which causes serious health effects. Therefore, it is important to remove of Orange II from wastewater. There are several technologies to treat Orange II from wastewater ion exchange, electrochemistry, Fenton oxidation, etc. Adsorption is one of the cheapest and easy implement method that can be used for Orange II removal.

In this study, chitosan was used as the based material since being low cost and environmental friendly material. Moreover, metal binding biopolymers have been reported to be highly efficient in removal of contaminants from wastewater. Zirconium (Zr) is one of the metal that can be used for to obtain chitosan based composites. To improve the adsorption capacity of perlite, Zr(IV)/chitosan/perlite composite was prepared. Zr/Chitosan solution was first obtained and perlite was added to the solution and mixed . 200 mg/L Orange II solution and 0.6 g/L solid/liquid ratio was used during the experiments. pH (2-10), kinetic (0.5-24h), isotherm (0.01-0.2g), thermodynamic (25-45 oC) parameters were studied.

Orange II adsorption on Zr(IV)/chitosan/perlite composite was showed Langmuiran adsorption. It is found from the kinetic studies that pseudo-second order kinetic model was best described the adsorption study. Moreover, the adsorption process was endothermic, and Orange II adsorption onto Zr(IV)/chitosan/perlite composite occurs spontaneously. Maximum adsorption was found at natural pH level of Orange II solution. In conclusion, Zr(IV)/chitosan/perlite composite is a highly effective adsorbent for Orange II adsorption and for the other acidic dye adsorption.

Keywords: Chitosan, Zirconium, Adsorption

ID 59

Photocatalytic Degradation Of Orange Ii By Zirconium Doped Titania Photocatalysts

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Photocatalytic degradation of Orange II by zirconium doped titania photocatalysts Esra Bilgin Simsek,a Pelin Demircivi,* a* Yalova University, Chemical and Process Engineering Department, 77100, Yalova, TURKEY Titanium dioxide (TiO2) is a cheap, nontoxic and highly efficient photocatalyst for the degradation of organic contaminants. TiO2 has a wide band gap (3.2eV for anatase), therefore transition metals are used to improve its photocatalytic activity and extend to visible light response. Zr4+ is one of the transition metal that can be used for to improve photocatalytic activity of TiO2. As a cheap and nontoxic biopolymer, chitosan has been used to obtain an organic composite material by giving a reaction with TiO2 and Zr4+. In our study, Zr/Chitosan-TiO2 photocatalyst has been prepared by adding Ti(IV) n-butoxide and ZrOCl2 solution into the chitosan solution. The solution was mixed during 1h and calcinat ed at 500 oC for 2h. Zr/Chitosan, Zr/TiO2, Chitosan/TiO2 were also prepared using the same procedure. Orange II degradation under UV-light, visible-light and dark adsorption was studied. Orange II is an anionic azo dye that is used in many industries. To investigate the contribution of photocatalysis and adsorption in the process of Orange II removal, photodegradation of Orange II under visible light irradiation and adsorption process of Orange II in dark by the synthesized catalysis was compared. It was found that degradation of Orange II under visible light irradiation (84%) is much higher than the single adsorption process (22%). Also, degradation of Orange II under UV light irradiation was found 99%. When we compared the composites of Zr/Chitosan, Zr/TiO2, Chitosan/TiO2 and Zr/Chitosan-TiO2, the highest degradation was shown by Zr/Chitosan-TiO2 following by Chitosan/TiO2, Zr/TiO2 and Zr/Chitosan.

Keywords: Photocatalyst, Zirconium, Titanium, Chitosan
PANI-ZnO hybrid thin film
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Polyaniline-ZnO hybrid thin film with the content of ZnO varying from 10 wt% to 30 wt% were prepared by spin coater on the glass, metal, galvanized substrates. The structure and morphology of the hybrid system were characterized by the Fourier transform infrared (FTIR) spectra, X-ray diffraction (XRD), scanning electron microscopy (SEM). The shift in FTIR peaks of the hybrid system compared with PANI confirmed the chemical interaction between active sites in PANI and ZnO. The XRD pattern of the PANI-ZnO showed the additional characteristic peaks with corresponding PANI and ZnO nanoparticles were appeared. SEM results indicated that ZnO nanoparticles were dispersed uniformly in the PANI matrix. Atomic force microscopy (AFM) was used to evaluate the homogeneous distribution of the hybrid systems at the molecular level. AFM results indicated that PANI-ZnO was homogeneously distributed on the glass substrate. The potential application of PANI-ZnO hybrid thin films as humidity sensor will be evaluated in further studies.

Keywords: PANI, ZnO, thin film, spin coater, characterization

Development Of Sound Insulation Composites From Materials Obtained From Bird Feathers
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The most spread type of birds are chickens. Every year in the world, approximately 22mln. ton of chicken feathers appear as by-products in the production of white meat, and a considerable part of it is decomposed as waste. Research has shown that chicken feathers have many valuable properties, the most important of which is that these fibers are microporous. This article deals with the development of multilayered composite structures for sound insulation from fibers obtained chicken feathers and rachis material. Fibrous part of feathers were separated from the rachis by mechanical cutting with special machine. Composite structures were produced from each of these materials by hot pressing. Ethylene vinyl acetate was used as the bonding material. Structural analysis of the produced composites was made and sound insulation parameters were examined. 2-5 layer constructions were produced from these composites in various combinations. Examination of the sound absorption Parameters revealed that the developed materials have a high sound absorbing ability. Developed materials are lightly and also damped both high and low frequency sound waves. These materials produced from waste raw material are more economical with having better insulation parameters when compared to available sound insulation materials.

Keywords: Porous composite structures, chicken feather, chicken feather fiber, chicken feather rachis, sound isolation
Zeolites are microporous hydrated aluminosilicate minerals. Analcime (NaAlSi2O6•H2O) is the smallest-pore natural zeolite. Its small pores are arranged in four, six and eight-member rings. In this study, the adsorption of H2 (hydrogen) on analcime tuff from Trakya, Turkey and those of acid activated forms (1HA, 2HA and 3HA) were investigated. XRD, DTA, TG/DTG and N2 adsorption methods were used for thermal and structural characterization of analcime samples before and after acid treatment. The adsorption experiments were conducted on volumetric Autosorb-1C instrument for determination H2 adsorption capacity up to 100 kPa and 77 K. Analcime sample were crushed, ground and sieved to pass through a < 45 µm sieve. For the HCl acid treatment, 5 g samples of analcime were activated in 100 ml of 1, 2 and 3 M hydrochloric acid solutions at a temperature of 80 °C with shaking for 5h. It was found that the specific surface area values and the retentions of H2 gas of acid activated analcime samples increased with the increase of concentration of acid solution.

Keywords: Analcime, Hydrogen, XRD, BET, DTA, TG/DTG

Water sorption is one of the most significant properties of zeolites and, hence, their use as desiccants. The amount of adsorbed water is a function of the relative vapor pressure at a given temperature and depends on many factors, such as the presence of mesopores, impurities, crystallinity, the particle size and the micropore capacity. Water, which has diameter of about 2.66 Å, plays an important role in many practical applications such as ion-exchange and separation. In this study, water vapor adsorption properties of the clinoptilolite rich zeolite tuff, from Bigadic and Gordes were investigated. Water adsorption isotherms of clinoptilolite samples were obtained by a static volumetric method. XRD and TG-DTA methods were used for the characterization of the zeolites. The heats of immersion (Qimm) of natural clinoptilolite samples were measured with a Calvet calorimeter at 30 °C. Water adsorption isotherms for both adsorbents at 298 K were obtained at pressures up to 2.39 kPa. It was found that natural clinoptilolite (G-CLN.) obtained from Manisa–Gordes is more suitable for a desiccant material than natural clinoptilolite (B-CLN.) from Bigadic.

Keywords: clinoptilolite, water vapor, thermal analysis, immersion heat, XRD.
Natural zeolites are abundant and low cost materials, which are aluminosilicates with a framework structure composed of \([\text{SiO}_4]^{4-}\) and \([\text{AlO}_4]^{5-}\) tetrahedra joined by common oxygen atoms. The net negative charge on the framework is neutralized by the presence of exchangeable cations such as K+, Na+, Ca2+ etc. Mordenite is naturally-occurring high silica zeolite and has two pore channels; one is composed of a twelve membered channel (6.7Å x 7.0Å) running along the c-axes and the other is an eight membered ring (2.6Å x 5.7Å) running along the b-axes. Thermal behavior of natural zeolites is important for many application areas. In this study, thermal and structural characterization properties of mordenite supplied from Sivas-Yavuz region of Turkey and their ion exchanged forms (H+, Ag+, K+, Na+, Mg2+ and Ca2+) were investigated. The zeolite samples were ground to pass through a ≤ 45 µm sieve. The mordenite samples were characterized using X-ray diffraction (XRD), thermogravimetric analysis (TG), differential thermogravimetric analysis (DTG) and differential thermal analysis (DTA). Quantitative XRD analysis showed that the mainly components of the natural zeolite were clinoptilolite \((d=8.94, 7.86, 3.88 \text{ Å})\) and mordenite \((d=6.55, 4.49, 3.45 \text{ ve } 2.95 \text{ Å})\), together with minor amounts of quartz \((d=4.24, 3.34 \text{ ve } 2.45 \text{ Å})\) and feldspar \((d=3.20 \text{ Å})\).

**Keywords:** Mordenite, clinoptilolite, TG/DTG, DTA, XRD

In this study, samples of activated carbon were prepared from pomegranate pulp by chemical activation. H3PO4 was used as chemical activation agent and three impregnation ratios (50-100-200%) by mass were applied on biomass at impregnation times of 24 and 48 hours. Carbonization is applied to impregnated biomass samples under N2 sweeping gas in a fixed bed reactor at 500 and 700 °C. For determination of chemical and physical properties of the obtained activated carbons; elemental analysis was applied to determine the elemental composition (C, H, N, O) and FT-IR spectra was used to analyze the functional groups. BET equation was used to calculate the surface areas of activated carbons. For understanding the changes in the surface structure, activated carbons were conducted to Scanning Electron Microscopy (SEM). Maximum BET surface area (840 m2/g) was reached with the activated carbon generated using 200% H3PO4 impregnated biomass sample, at a carbonization temperature of 700°C and impregnation time of 48 hour. Experimental results showed that impregnation ratio have a significant effect on the pore structure of activated carbon and pomegranate pulp seems to be an alternative precursor for commercial activated carbon production.

**Keywords:** Chemical activation, carbonization, characterization, activated carbon, biomass
ID 70

Removal of Methylene Blue onto Green Clay From Waste Water

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In this study; removal of methylene blue onto natural green clay, obtained from Gürpinar district of Van, from aqueous solution were investigated. The structural characteristics of the clay sample were performed analysis of SEM, XRD, FTIR, TGA and BET surface area. The removal of methylene blue which is a cationic dye onto clay mineral were investigated the effect of some parameters such as temperature, concentration, time and pH. Natural clay used in the experiment was ground and dried in an oven at 105 °C and then it was passed through 325 mesh sieve range. Morphology and surface area of the adsorbent was determined by SEM and BET equipments. SEM image of Gürpinar green clay was given below. It was found at pH 9, 55 ºC and 2.5x10^{-5} M the initial concentration of methylene blue from experimental data for the capacity of the maximum removal and the thermodynamic parameters (Ea, ΔH, ΔG, ΔS) were calculated from the data. The positive enthalpy and the negative Gibbs free energy changes showed that the removal of dye is endothermic and spontaneously, respectively. From the experimental data, it was determined to be appropriate the second order kinetic equation for the removal of methylene blue onto clay from aqueous solution. As a result, the Gürpinar clay in the removal process of methylene blue from aqueous solution was shown to be an effective adsorbent.

Keywords: Green clay, dye removal, thermodynamic parameters, methylene blue

ID 71

Sorption Of The Methylene Blue From Aqueous Solution By Polyethylene Composite Films

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In this study; bi-component composite film containing polyethylene and a natural clay obtained from Gürpinar district of Van using a single screw extruder and controlled microprocessing apparatus (designed by us and laboratory type) was synthesized. The synthesized composite films was performed characterization using FTIR-ATR, TG and SEM-EDX apparatus. The removal process and some thermodynamic parameters (EA, ΔH, ΔG and ΔS) using these composite films were investigated and calculated in aqueous solution containing methylene blue. Natural clay used in the experiment was ground and dried in an oven at 105 °C and then passed through 325 mesh sieve range. Powdered polyethylene purchased from PETKIM passed through the sieve will have the same particle size with clay. Mass ratio (m/m) of polyethylene/clay composite was chosen as (1:1). Then polyethylene/clay composite films were synthesized in a controlled manner as homogeneous in laboratory-type extruder apparatus at 180 °C. Experiments of removal of methylene blue from aqueous solution were performed using composite films under various physico-chemical parameters after some characterization procedures. It was studied some parameters such as dye concentration, pH, time and temperature effects in experiments. Also some thermodynamic parameters were calculated from the experimental data. Composite films verified presence of interference and structure of components from FTIR spectra. Maximum removal from experimental data was determined to occur at 55ºC and pH 9. The positive enthalpy and the negative Gibbs free energy changes showed that the removal of dye is endothermic and spontaneously, respectively. From the experimental data, it was determined to be appropriate the second order kinetic equation for the removal of methylene blue from aqueous solution onto composite film. As a result, polyethylene/clay composite films were synthesized using a laboratory-type extruder device and shown to be an effective adsorbent for the removal process of methylene blue from aqueous solution.

Keywords: Polyethylene, Clay, Composite film, Thermodynamic parameters, Extruder, Methylene blue
Adsorption Kinetics Of A Cationic Textile Dye From Wastewater
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The adsorption kinetics and thermodynamics of Maxilon Blue 5G, a cationic textile dye, onto perlite were investigated in aqueous solution in a batch system for determining the effect of contact time, stirring speed, initial dye concentration, initial solution pH, ionic strength and temperature. Experimental data were evaluated according to the pseudo-first, second-order and the Elovich equation, mass transfer and intra-particle diffusion models, and it was found that adsorption kinetics can be described according to the pseudo-second-order model, from which the rate constant and the adsorption capacity were determined. The thermodynamic activation parameters, such as activation energy, enthalpy, entropy and Gibbs free energy, were determined. The obtained results confirmed the applicability of this mineral as an efficient adsorbent for cationic dyes.

Keywords: Kinetics; Thermodynamics; Cationic dye; Perlite; Adsorption

Particle Size and Shell-Thickness Dependence of The Light Intensity Enhancement in The Cap Layers Of Ag, Au, Al and Sio2@TiO2 Core-Shell Nanostructures
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We performed finite-difference, time domain (FDTD) simulations, which give numerical solutions of Maxwell's equations, to obtain the light intensity profiles near half-buried spherical particles capped with TiO2 layers when they are illuminated by a UV light at 380 nm. SiO2@TiO2, Ag@TiO2 and Au@TiO2 core-shell nanostructures have been shown to have enhanced photocatalytic properties compared to bulk films. Our system is slightly different than that of the single core-shell nanoparticles in that it involves half-buried spherical Ag, Au, Al and SiO2 particles covered by a layer of TiO2 at the surface of the oxide film. We systematically study the particle size and TiO2–shell thickness dependence of the light intensity enhancement within the cap layers. Our calculations cover the particle-size range between 20 and 160 nm, and the cap thickness range between 6 and 90 nm. To our knowledge, this is the first report describing intensity enhancement in the cap layers of the Al@TiO2 core-shell nanostructures. The results show that, in the cap layers, an average intensity enhancement of ~7 can be obtained for a cap thickness of ~30 nm above Ag and Al particles. The average enhancement above Au and SiO2 particles is ~3 for the same cap thickness.

Keywords: Titanium dioxide, Core-shell nanoparticles, Photocatalytic efficiency, FDTD, Near-field effects
ID 83

Study of The Colour Variation Of Different Glaze Types By Using Mixture of Pigments Based on a Triaxial Diagram

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In this study, production and characterization of iron oxide based pigments for ceramic glazes were developed by using Al2O3-Fe2O3-natural iron based raw material. Colour variations in the the triaxial diagram and the effect of frit type on pigments L*a*b* values were investigated. Raw materials were characterized by XRF, XRD and spectrophotometer. When natural raw materials with one mineralizer was used and calcined at the selected peak temperature, two different type of frits was used for the triaxial diagram. After firing under laboratory conditions, glaze colours were characterized by a spectrophotometer and x-ray diffractometer (XRD). Finally, selected glazes includinig newly developed pigments were applied onto 3-D ceramic forms.

Keywords: Pigment, triaxial diagram, glaze.

ID 85

Enhanced Hydrophilicity of Polymeric Membrane for Oil-Water Separation with the Addition of Graphene Oxide

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Recovery of water from oil in water nanoemulsions is a promising approach to effective usage of water. Current ultrafiltration membranes for this purpose suffer from fouling and low fluxes. In this study, a graphene oxide (GO) assisted polymeric ultrafiltration membrane is synthesised via phase inversion method to enhance the hydrophilicity of the membrane, therefore, overcome fouling and low flux problem. GO is prepared via eco-friendly modified Hummers method with two different drying procedures and characterized with SEM, Raman spectroscopy, BET surface area analyser, zeta potential and particle size analyser, TGA and FTIR spectroscopy. The synthesised membrane is subjected to sessile drop analysis, SEM, pure water flux analysis, oil rejection analysis and fouling tests, and compared with bare polymeric membrane. In addition to experimental studies, molecular dynamics simulations are done in order to show interaction between graphene/graphene oxide and water molecules. Compared with the bare membrane, GO-assisted membrane shows approximately three times higher water flux. GO-assisted membrane has 99.3% oil-surfactant rejection while bare membrane has 96.8%. The study shows GO-assisted membrane is an up-and-coming candidate for recovery of water from oil-in-water nanoemulsions.

Keywords: graphene oxide, membrane, oil-water nanoemulsions, water recovery, molecular dynamics simulations
A New Microfluidic Extraction System Equipped With A Multiple Feeding System For Human Genomic Dna (Hg-Dna) Isolation From Whole-Blood

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A new human genomic-DNA (hg-DNA) microfluidic extraction system with a multiple feeding equipment was constructed using monodisperse- porous silica microspheres with bimodal pore-size distribution and with a mean size of 5.5 micron as the stationary phase. Monodisperse-porous silica microspheres were obtained by a newly developed staged-shape template hydrolysis-condensation protocol by using monodisperse-porous poly(methacrylic acid-co-ethylene dimethacrylate) microspheres as the seed material. The stationary phase was obtained by slurry packing of monodisperse-porous silica microspheres into the fused silica capillary tubing 300 micron in diameter and 40 mm in length. Three feeding holes were found in the microfluidic extraction system. These holes were separately used for feeding of adsorption, washing and elution buffers into the stationary phase using three separate microinjection pumps. Hence, the microextraction process can be completed in the continuous mode without pausing between adsorption, washing and elution stages. Human genomic DNA microextractions from whole blood were performed by controlling the flows of the adsorption, washing and desorption phases either in manual or computer controlled modes with RS232 interface. In the hg-DNA isolation experiments, 1X TE buffer containing 6M guanidium-HCl at pH 6.0, ethanol-water mixture (80/20 v/v) and 1X TE buffer at pH 8.5 were used as the binding, washing and desorption medium respectively using human whole-blood as the hg-DNA source. For this purpose, whole blood was lysed using Triton-X and Proteinase-K. In the hg-DNA isolation runs performed either in manual or computer controlled modes, the sample volume was changed between 10-50 μL by fixing the lysate/binding buffer volume ratio to 1/4. The isolation yields close to 40 % w/w based on loaded hg-DNA was achieved. The results indicated that the microextraction system equipped with a multi-feeding system is promising particularly for the automatization of hg-DNA microextraction with low sample volumes. This research was supported by a grant-in-aid for scientific research from the Scientific and Technological Research Council of Turkey (TUBITAK) under contract numbered 213S140.

Keywords: DNA, microextraction, adsorption, sorbent, silica, microsphere

Optimization of Gypsum Foam Mechanical Properties via Alpha-hemihydrate Addition

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Hemihydrate gypsum (CaSO4.1/2H2O, usually called as plaster of Paris) has two different mineralogical modification called as alpha and beta. Beta hemihydrate is used in construction industry. Alpha form is used mold making and dentistry. The main difference between them is the strength development after hydration. Alpha hemihydrate gives higher strength than beta. Gypsum foam materials are becoming important material in construction industry due to excellent heat and sound insulation. However, lowering the strength properties by foaming is the main drawbacks. The main objective of this study was to investigate the effect of alpha hemihydrate addition on the strength development of the gypsum foam product which is produced mainly from beta hemihydrate. Sodium Lauryl Sulphate-SLES (NaC12H25SO4) was used as a foaming agent. Different sample series were produced by changing the foam and alpha hemihydrate ratio. It was concluded that, beta hemihydrates resulted larger pore structure than alpha hemihydrate. SEM investigation showed that both hemihydrates have different hydration morphology and this resulted in different pore structure after foaming process. However, important strength development obtained when alpha hemihydrates introduced to the foam gypsum system. Alpha hemihydrates addition has great cost effective potential for optimization of the strength properties of the foam gypsum product.

Keywords: Foam gypsum, alpha hemihydrates, porosity, strength
Zinc oxide nanostructures were grown on commercially pure zinc substrates by the electrochemical anodization method under potentiostatic regime. Electrochemical anodization was performed in 1wt % hydrofluoric acid aqueous solutions with various voltage and time periods at room temperature. The anodized samples were annealed at 300°C for 1 h in air in order to obtain nanostructures with enhanced surface area. As-prepared nano structures were characterized by scanning electron microscopy and X-ray diffraction, The morphology and photocatalytic efficiency greatly depends on the used anodization parameters. The photocatalytic activity of the samples for the degradation of methylene blue (MB) under visible light irradiation were evaluated and absorbance was measured with UV-Vis light spectroscopy. The ZnO photocatalyst showed excellent degradation activity against the MB aqueous solution. The photocatalytic performances of the prepared nanostructured ZnO samples have been discussed.

**Keywords:** Zinc oxide; nanotube; photocatalysis; electrochemical anodization

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Expanded perlite aggregate (EPA) is a porous, lightweight, fire resistant and moisture retaining material with thermal insulation properties. The thermal conductivity value of EPA (50-100 kg/m³) is around 0.040-0.050 W/mK. However this value exponentially increases depending on the increase of aggregate unit volume mass (UVM) (by squeezing). The aim of the study, with the help of potentially usable natural local perlite and clay resources; for mass production of thermal insulation board before production with laboratory measure, is the mixture ratio optimization of EPA’s relation with composites structured UVM for thermal resistance performance. In the development of composites structure material, EPA is going to be used as filling material. In Expanded Perlite Board (EPB), clay as binding/matrix; not having side effect in binding such as ASR (Alcali Silica Reaction) and having a low cost, also mineral wool fibres ability to increase elasticity and due to decreasing the VUM ratio has been chosen. A number of expanded perlite clay based (EPCB) samples having different mixtures were prepared and tested. It was observed that depending on the expansion ratio of the EPA, the addition of mineral wool fibres into the mixtures increased the strength and thermal resistance performance of the samples.

**Keywords:** Expanded Perlite Aggregate, Clay, Thermal Conductivity, Unit Volume Mass
ID 104

Synthesis and Characterization of Porous Carbons by Using Natural Bentonite as Template
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Porous carbons templated from inorganic materials have recently attracted much interest because of their potential applications such as adsorbents, catalysts, electrodes. In this study, porous carbons were prepared through the template carbonization method using the natural bentonite as template and sugar as carbon precursor. The effects of synthesis conditions such as carbonization temperature and sugar concentration on the pore structure of carbons were investigated. The carbonization temperature was selected as 600 °C, 700 °C, 800 °C and 900 °C and the sugar concentration was changed as 1 wt%, 5 wt% and 10 wt%. The physical, structural and surface properties of produced porous carbons were characterized using the nitrogen adsorption, scanning electron microscopy, transmission electron microscopy, X-ray diffraction, FTIR spectrometry and elemental analysis. According to the results of nitrogen adsorption, it was seen that there are proportional variation between the surface area of carbons and the carbonization temperature except for the sample which carbonized at 900°C. The mesopore volumes were increased with the increase of carbonization temperature. The layered structure of clay selected as template was observed in SEM images of produced carbons.

Keywords: Templated synthesis, porous carbon, characterization

ID 106

Recycling of Steel Casting Wastes in Cement Production
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The waste production in manufacturing industry is made of approximately %60 of metal industry in Turkey. It is reported that the amount of slag generated from this sector is about 5 million tons per year and 87% of these wastes are kept at the enterprises, 12% are stored regularly and 1% is recycled. The environmental pollution caused by leaving these wastes from the metal industry for many years without control has been very harmful to nature. In order to reduce these losses and to recycle these wastes, many institutions, especially the state, have started to work. Iron scale is the one of the slags from metal industry. Scale is the iron oxide layer which is formed as a result of oxidation during annealing in the rolling mills of iron-steel plants, continuous casting plants and steel material surfaces coming from annealing furnaces. It contains components such as silicon oxide, calcium oxide, alumina and iron oxide. It is used in the construction of heavy concrete due to these metals in the scale, and this concrete is used in nuclear plants, the walls of rooms exposed to radiation in hospitals, etc. Scale and similar slags are used as building aggregates in many applications such as asphalt concrete, portland cement concrete, road filler, dirt road, walking road. These and similar studies have increased the amount of waste recovered over the years. Significant contributions are made to this economical economy and technology of this country. In this study, to improve the recycling of the iron scale and to better see the contribution and benefit in the cement industry, the scale was mixed with the cement at certain ratios and the cement mortar was prepared with the mixture. The mechanical analysis of the obtained samples was examined and the optimum additive ratio was determined.

Keywords: casting wastes, metal casting, scale, cement mortar
ID 111

**Preliminary investigation of flash sintering of HAP-TiO\(_2\) composite**

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Hydroxyapatite (HAP) has generated great attention as an advanced orthopedic implant candidate due to its bioactive properties and biological similarities with the host material. Traditionally HAP is sintered at 1250°C, which is above decomposition temperature for the occurrence of undesired phases that result chemical and mechanical instability. To reduce sintering temperature of HAP, electric field assisted techniques (such as spark plasma sintering) have been carried out. Flash sintering, which is a novel electric field assisted sintering method, reduces the sintering time and temperature enormously. The technique is basically based on the application of an electric field to the specimen while heating. Since the electrical conductivity of HAP is low, controlled mixing of TiO\(_2\) and HAP was performed to create a composite in order to achieve high density under an electric field. TiO\(_2\) additive was chosen to optimize mechanical properties while maintaining biocompatibility. Here, preliminary investigation of flash sintering pure and HAP-TiO\(_2\)(10 wt\%) composite is reported.

**Keywords:** Hydroxyapatite, flash sintering, sintering

ID 112

**Effects of Zn-doping on the photocatalytic activity and microstructures of nanocrystalline SnO\(_2\) powders**

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In this study, undoped and Zn-doped SnO\(_2\) nanoparticles in different concentrations were synthesized by flame spray pyrolysis (FSP) technique. The produced particles were post-annealed after FSP process at 600°C in order to obtain crystalline structure. The structural analysis of the produced powders was performed by X-Ray Diffraction (XRD) method. The surface morphology and particle size distribution of the nanoparticles were identified using scanning electron microscopy (SEM), and dynamic light scattering (DLS) techniques. In addition, photocatalytic degradation of aqueous methylene blue (MB) solutions were evaluated using undoped and Zn-doped SnO\(_2\) nanoparticles under UV light illumination. Photocatalytic degradation of the MB solutions followed the pseudo-first-order kinetics and the effect of the Zn doping amount on the photocatalytic reaction was investigated.

**Keywords:** SnO\(_2\); Zn doped; flame spray pyrolysis; photocatalysis
ID 113

Synthesis and Characterization of Potassium Modified Copper and Iron containing 3D catalysts
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In recent years, 3D cubic mesoporous silica material SBA-16 has been attracted as catalyst supports in reactions applications due to interconnected spherical mesopores provide easy accessible for a wide variety of guest molecules. In present study, copper, iron and potassium modified copper, iron SBA-16 catalysts were synthesized by the hydrothermal method. All syntheses were carried out metal/Si and potassium/Si molar ratio as taken 0.06 and 0.001, respectively. The catalysts were characterized by XRD, nitrogen adsorption/desorption isotherms, TEM/EDX and FTIR analysis techniques. The XRD patterns showed that all the catalysts exhibited the characteristic peaks of SBA-16. While the BET surface area values of SBA-16 were decreased from 678 m²/g to 353 m²/g with metal loading to the SBA-16 structure its total pore volume and pore diameter values were increased from 1.18 nm to 1.42 and 8.95 nm to 11.2 nm, respectively. The TEM images showed that metals were incorporated as nanoparticles to the SBA-16 structure. It’s seen that from the EDX results potassium modification treatment was increased to copper incorporation in the Cu-SBA-16 catalysts. The FTIR spectrums of catalysts showed similar behavior with SBA-16 and the metal loading didn’t change the SBA-16 support structure.

Keywords: SBA-16, potassium modification, synthesis, characterization

ID 114

Microstructure and photocatalytic activity of porous TiO2 layers produced by anodic spark oxidation
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Photocatalytic technology is a very important aspect of environmental pollution in recent years. TiO2-based photocatalysts are largely used for wastewater treatment because they have remarkably superior properties such as high photocatalytic activity, high photochemical stability, low cost, and non-toxicity. The aim of this study is to evaluate the photocatalytic activities of the porous TiO2 layers for the degradation of methylene blue (MB) as a model organic contaminant under UV irradiation. TiO2 layers were prepared using anodic spark oxidation method in three different electrolytes. To evaluate and compare the phase structure and surface morphology of the prepared TiO2 layers, X-ray diffraction analysis (XRD) and electron microscopy (SEM) were applied. A UV–vis spectrophotometer was also used to study optical properties of the TiO2 layers. The results showed that changes in both the crystalline structure and morphology have a strong influence on the photoactivity of the layers.

Keywords: Anodic spark oxidation; titanium dioxide; phase; photocatalyst; methylene blue
ID 115

Synthesis and Photocatalytic Activity of Polyaniline–Doped SnO2 over Diatomite Support Hybrid Photocatalysts
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In this study, polyaniline–doped SnO2 over diatomite support hybrid photocatalysts were prepared by chemical oxidative polymerization of aniline monomer using potassium per sulfate as oxidizing agent in HCl solution in the presence of tin oxide and diatomite. The synthesized catalysts were characterized by XRD, nitrogen adsorption/desorption isotherms, SEM/EDS and FTIR techniques. The photocatalytic activities of catalysts were evaluated by the photodegradation of Remazol Yellow (RY) under UV light. The XRD patterns of catalysts showed that the presence of the silica (from diatomite), SnO2 and polyaniline species in the catalyst structure. It seen that from the SEM images, the diatomite/SnO2 was covered with polyaniline chain. The highest BET surface area, total pore volume and pore diameter values were observed as 148 m2/g, 0.46 (cm3/g) and 3.71 nm, respectively. The FTIR spectrum of catalysts was exhibited the characteristics peaks of silica, SnO2 and polyaniline. The photocatalytic activity experiments were performed at different the amount of catalyst (0.25-1 g/L), 50 ppm RY concentration and room temperature. The concentration of the RY was measured with a UV-vis spectrophotometer. Although RY degradation was obtained as 9 % in performed activity tests without catalyst; it was increased up to 91 % with using of catalyst.

Keywords: Hybrid catalyst, Remazol Yellow, photocatalytic activity

ID 118

An Experimental And Numerical Study On Green Strength Of Ferrous Metal Powders
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Uniaxial cold compaction of metal powders is an important processing route in powder metallurgy. Defects that occur during cold compaction stage negatively effect the mechanical properties of the workpiece. The objective of this study is to determine the green strength of pre-alloyed water atomized iron powders by diametral compression test. Disc shaped samples are prepared by uniaxial cold compaction of metal powders under different pressures. Tensile strength and fracture energy of green samples have been determined experimentally. Finite element analysis have been used to elucidate the deformation and fracture behaviour of ferrous powder compacts. The study showed that increase in cold compaction pressure led to considerable improvement in green strength and fracture energy of the samples.

Keywords: Powder mechanics, Ferrous powder, Green strength, Fracture energy, Diametral compression test,
ID 119

Microstructure and photocatalytic properties of Zn-Ni alloy coatings produced by electrodeposition process

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First, the Zn-Ni alloy coatings were electrodeposited on titanium from an acidic sulphate bath; after that, they were treated at various annealing temperatures to obtain oxide layers. Effects of the annealing temperatures on crystal structure, chemical composition and surface morphology of Zn-Ni layers were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS), respectively. The photocatalytic experiments were performed by photodegradation of methylene blue (MB) in aqueous solutions under UV light irradiation. The detailed mechanism for the photocatalytic decomposition of MB using Zn-Ni photocatalyst was discussed.

Keywords: Zn-Ni alloy; electrodeposition; annealing; X-ray photoelectron spectroscopy; photocatalytic properties.

ID 121

Synthesis Ni/Al2O3 Catalysts For Gasification Of Tea Waste For Hydrogen Rich Gas Production

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In this study, Ni/Al2O3 catalysts with different Ni loadings (10-30 wt%) were synthesized by impregnation method. The synthesized catalysts were characterized by XRD, XRF, BET, SEM and TGA techniques. The catalytic performance was determined in air gasification reactions of tea waste in an updraft gasifier at 650 and 850°C temperatures, 20% catalyst ratio, 15 min reaction time and 3 L/h air flow rate. H2 yield increased with the increasing Ni content in the catalyst. Maximum H2 yield was achieved as 5.96 mol H2/kg tea waste in the presence of Ni/Al2O3 with Ni amount of 30 wt%. In addition, gasification reactions of tea waste which were performed in previous work (Ayas and Esen, 2016) in the presence of K2CO3 were improved and H2 yield increased from 3.54 to 5.01 mol H2/kg tea waste at 20% K2CO3 ratio. The composition of the liquid product obtained from gasification of tea waste was determined using GC-MS.

Keywords: Gasification, Hydrogen, Tea Waste, Ni/Al2O3, Impregnation
ID 124


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The conventional water remediation technologies are restricted to remove organic/inorganic and toxic pollutants via biological and physico-chemical methods because of the complex biological process or the non-renewable adsorption materials. So the development of semiconductor photocatalysts such as titanium dioxide (TiO2) that have non-toxicity, low cost, high stability and excellent oxidation capability has been the focus of considerable attention.

In this study, modified TiO2 nanoparticles for visible light utilization were prepared via sol-gel process. To improve the photocatalytic activity we utilized novel surfactants during sol gel process which define the template of TiO2 particles. The synthesis involved titanium(IV)isopropoxide (TIP) molecules as precursor and commercial(nonionic)/novel cationic surfactants containing amide functional groups. Surfactant were particle size inhibitors and pore directing agents into a stable titania sol and affected the physicochemical properties of TiO2 nanoparticles such as their crystallographic structure, morphology, and defect structure. The crystal structure and optical properties of TiO2/surfactant nanoparticles as attained composite materials were investigated through SEM, TEM, XRD and UV-vis DRS. Photocatalytic properties of characterized TiO2/surfactant were tested for 10 ppm Cr(VI) and Methylene Blue as model pollutant compounds under UV (254 nm) and near visible light (≥365 nm).

**Keywords:** Sol-Gel, Titanium Dioxide, Surfactant, Cr(VI), Methylene Blue

ID 125

Synthesis and characterization of organophilic clay-doped porous composite materials

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High internal phase emulsion (HIPE) templating is one of the methods for the preparation of macroporous materials, which allows to obtain the polymeric foams at desired functionality and morphology.

In this work, styrene-divinyl benzene-based porous composite materials were prepared using organo-modified montmorillonite clay. The Na-MMT clay was modified using a quaternary ammonium salt and loaded in emulsions in the range of 0.25-1.00 wt % during the preparation of composite material. The effects of the loading percentage of organophilic clay on morphology and thermal behavior of the porous polymer were investigated. The modified montmorillonite clay was characterized by Scanning electron microscopy (SEM), X-ray diffraction (XRD) and Thermogravimetric analysis (TGA). The thermal properties of the neat porous polymer and composite materials were studied by TGA and also morphology were investigated by SEM.

As a result; using only in 0.75 wt % organophilic nanoclay for preparation of the high internal phase emulsion-templated porous polymers not only contributed to stabilization of emulsion, but also enhanced the thermal stability compared with neat polymer. Moreover, this composite displayed about 589% higher dye adsorption capacity than the neat polymer. The composite materials have exhibited nearly closed-cell morphology in especially 0.75 and 1.00 wt % organophilic nanoclay loading.

**Keywords:** emulsion templating, organophilic clay, polymeric foams
ID 126

Enhanced Photocatalytic Properties Of Sn-Doped Zno Nanoparticles By Flame Spray Pyrolysis Under Uv Light Irradiation

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Zinc oxide (ZnO) is widely used in different areas thanks to its unique photocatalytic, optic and electrical properties. Sn doped ZnO nanoparticles were synthesized through flame spray pyrolysis (FSP) technique. The Sn dopant concentrations were 1, 3, 5, 7 and 9 at. % in produced ZnO nanoparticles. The structural analysis of the produced powders was performed by X-Ray Diffraction (XRD) method. The surface morphology and particle size distribution of the nanoparticles were identified using scanning electron microscopy (SEM), and dynamic light scattering (DLS) techniques. In addition to this, produced photocatalysts were evaluated for degradation of aqueous methylene blue (MB) solutions under UV light irradiation. Sn-doped nanoparticles have superior photocatalytic activity compared to un-doped ZnO.

Keywords: ZnO; Sn-doped; nanoparticles; photocatalysis; flame spray pyrolysis

ID 127

Co-Ni-B/ Magnesite Catalyst for Hydrogen Generation by Hydrolysis of Sodium Borohydride

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Sodium borohydride (NaBH4) is considered as an ideal hydrogen source due to its stable, non-flammable and non-toxic in nature with hydrogen density of 10.8 wt.%. Hydrogen can be generated through the hydrolysis of NaBH4 by using a suitable catalyst. Sodium borohydride hydrolysis occurs as follow: NaBH4 + H2O → NaBO2 + 4H2 ΔH = -217 kJ/mol The noble metal catalysts have the high catalytic activities. However, their applications were limited due to scarce source and high cost. Metal borides were studied extensively due to their catalytic activity and low cost. Among them, cobalt and nickel borides received considerable attention as high efficient catalyst for NaBH4 hydrolysis. In the present study, Co-Ni-B catalysts were synthesized on the magnesite by impregnation using cobalt (II) chloride and nickel (II) chloride solutions and then were reduced by sodium borohydride solution, with different molar ratios of Co/Ni. The Co/Ni molar ratios in Co-Ni-B/ magnesite catalyst were 0:1, 1:1, 2:1, 5:1, 1:0. The hydrogen generation activity of Co-Ni-B/magnesite catalyst was tested through hydrolysis of sodium borohydride alkaline solution. Effects of Co/Ni molar ratio and reaction temperature on hydrogen generation rate were investigated.

Keywords: NaBH4, Hydrogen, Magnesite
Ni-B/ Sepiolite Catalyst for Hydrogen Generation by Hydrolysis of Sodium Borohydride
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Hydrogen is considered as a good energy in the future due to its non-toxic, environmental-friendly, a variety of sources to obtain and the relatively low cost. There are many methods to produce hydrogen. Among them, the most attractive one is the generation of hydrogen by hydrolysis of alkaline metal hydrides. Sodium borohydride shows the high qualities for providing a safe and practical way to generate hydrogen. Hydrogen can be generated through the hydrolysis of NaBH4 by using a suitable catalyst. Metal boride catalysts such as cobalt and nickel borides received considerable attention as high efficient catalyst for NaBH4 hydrolysis. In this study, Ni-B catalyst was synthesized on the sepiolite by impregnation using nickel (II) chloride solution and then was reducted by sodium borohydride solution. The hydrogen generation activity of Ni-B/sepiolite catalyst was tested through hydrolysis of sodium borohydride alkaline solution. Effects of catalyst amount, NaBH4 concentration and reaction temperature on hydrogen generation rate were investigated. The hydrogen generation rate was obtained as 1455 mL/min gNi at 50°C. The kinetics of catalytic hydrolysis reaction was also examined. The reaction kinetics obeyed the zeroth order kinetic model. The activation energy of hydrolysis reaction was estimated be 40.24 kJ / mol.

Keywords: NaBH4, Hydrogen, Sepiolite, Storage Material

Fibrous Nanocomposite Scaffolds Containing Biopolymer Capped Silver Nanoparticles
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Electrospinning has drawn much attention in tissue engineering applications because electrospun fiber mats have web like nature, high porosity, very small pore size and large specific surface area. Developing scaffolds for tissue engineering applications presents challenges, including microbial contamination faced by the implantation of the scaffolds. As antibacterial agents, the metal nanoparticles are very efficient to prevent this microbial contamination. Within this respective, this study aims to incorporate metal nanoparticles within a polymeric matrix to fabricate a novel nanocomposite material. As a cell template, this nanocomposite material was fabricated using electrospinning method. For this purpose, silver nanoparticles were first prepared by chemical reduction method with biopolymers. Then, the as-prepared silver nanoparticles were introduced into the polymer solution from which electrospun nanocomposite fibrous mats were produced through electrospinning method. After that, physical and chemical properties of the mats were determined using scanning electron microscope, X-ray diffraction, and Fourier transform infrared spectrophotometer. Moreover, in vitro bioactivity of the mats was tested by immersing them in simulated body fluid. Furthermore, metallic ion release from the mats were investigated by using inductively coupled plasma optical emission spectrometry. Results suggested the potential of the metal–polymer nanocomposite mats as scaffolds for tissue engineering applications. Therefore, this study hold great promise in developing scaffolds with functionalized features.

Keywords: Metal nanoparticles, Nanocomposite, scaffold, tissue engineering
Utilization Of Phenolic Compounds As Antibacterial Agents For Paper Based Bone Tissue Engineering Applications

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Pore size, distribution and connectivity are very important parameters in the design of scaffolds for bone tissue engineering applications as they determine the attachment, proliferation and infiltration of cells and signalling molecules. Laboratory grade paper (Whatman) that is used in many routine filtering processes is recently shown to be a very promising candidate for use as a scaffold material in tissue engineering applications as they are commercially available at different pore sizes and thicknesses. Though not biodegradable, Whatman paper constitutes cellulosic fibers which are extremely biocompatible, representing a good scaffold candidate. Phenolic compounds are derived from natural substances and they are known for their antimicrobial, antiinflammatory and anticarcinogenic properties. In this study, grade 114 Whatman paper (average pore size of 25 µm, 190 µm thickness) was used as a scaffold material for various bone tissue derived stem, normal and cancer cells and the effect of two natural phenolic compounds, carnosol and carnosic acid, were tested on the on the viability and function of those cells.

Keywords: Whatman paper, carnosol, bone, tissue engineering

Poly(Lactic Acid)-Marine Algae Biocomposites: Properties Of Mechanical, Thermal And Biodegradability

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Poly(lactic acid) is a renewable and biodegradable polymer which is used in different areas such as agricultural films, packaging, automotive and disposal parts. PLA has many advantages properties such as mechanical strength, produced from renewable resources and biodegradability. PLA is commonly used as a bio-based matrix because of high mechanical properties relatively according to other bioplastics. However, it has disadvantages like low thermal resistance and brittleness. Composites enhance and develop new properties of the materials. Algae are the primary producers living in the marine ecosystem. It contain acids, alkaloids, amines, cellulose, enzymes, glycosides, trace elements and inorganic minerals, lipids, sterols, steroids, fatty acids, phenolic components, phytohormones, pigments, proteins, amino acids, vitamins and volatile components. They are used in many applications as additive.

In this study, PLA biocomposite films were prepared with marine algae, montmorillonite and zeolite in chloroform solution. Tensile strenghts, thermal analysis and biodegradability of biocomposite films were investigated. Biodegradability of PLA-marine algae biocomposites carried out in a shorter time than PLA. However, tensile strenght and thermal resistance of biocomposites films decreased. In addition to this, PLA was blended with PEG400 to decrease stiffness of the material. The PLA-algae biocomposite and blend films can be used agricultural films and food packaing applications.

References

Keywords: Whatman paper, carnosol, bone, tissue engineering
Characterization of Used Polypropylene Based Automotive Parts and Their Recycling Properties

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"Due to high importance of recovering and reusing imposed by many regulations and directives, recycling studies must be evaluated during the entire life cycle of an automobile, from its conception to the end-of-life stage. The increase in the use of recycled materials in automotive parts has led to detailed studies in this area to understand the effect of recycling on the properties of these materials. However, compared to virgin materials, the degradation of recycled plastics in quality, durability, physical and mechanical properties, surface appearance and thermal properties have limited its use in the industry.

In order to eliminate these problems, formulation development studies are carried out by adding various fillers and additives, then specification critical requirements such as density, melt flow index, tensional, flexural and elongational properties, Izod impact tests, HDT (heat deflection temperature), Vicat (softening temperature), DSC (differential scanning calorimetry), FTIR (fourier transform infrared spectroscopy) analysis are performed to evaluate the properties of the recycled materials. According to the obtained test results optimization studies can be done to determine the final formulation when necessary.

Keywords: recycling, characterization, PP compounds

Binder Effect On Electrochemical Performance Of Zinc Electrodes For Nickel-Zinc Batteries

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The main objective of this study is to investigate the effect of initial zinc electrode morphology on nickel-zinc battery capacity. ZnO powders synthesized by mechanochemical and hydrothermal precipitation methods were mixed with lead oxide, calcium hydroxide and polyethylene glycol (PEG) to prepare zinc electrodes in pouch NiZn batteries. Batteries containing zinc electrodes with hexagonal ZnO powder showed slightly higher discharge capacities compared to batteries containing zinc electrodes with ZnO powders synthesized by hydrothermal precipitation methods. Results also revealed that binder loading in zinc electrode affects battery capacity. Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD) analysis reveal that initial morphology of zinc electrode changes drastically regardless of the initial microstructure after first charge/discharge process, and even the charge/discharge process is not complete. Binder content in zinc electrode improves battery capacity slightly. The results suggests a relationship between binder content and battery capacity, but in-situ analysis of microstructural evolution of zinc electrode during charge/discharge process is needed to confirm this relationship.

Keywords: Zinc electrode, NiZn secondary batteries, ZnO morphology
Polymer components are routinely employed in a wide variety of situations especially in the automotive industries because of their lightweight, durability, ease of shaping and some other properties. For visible applications, their aesthetic appeal is commonly enhanced by the application of surface coatings, such as paints or chrome plating. During the coating processes, it is commonly found that a significant number of components fall below the quality specified and increases the costs of the process, therefore some remedial actions are required. And also, at the end of component life, coating removal may be required to enhance its ability to be reused or recycled. The complete reutilization of polymeric and metallic substrates and the recovery of plating components, avoiding the contamination of the environment has gained more importance. Therefore started a project study for stripping, recovering and recycling metals from coated plastics materials by chemical or electrochemical methods.

In order to produce a successful product with the project, plastic and metal recovery studies will be carried out at the laboratory level. Then the production parameters will be determined during the prototype plant phase and the most efficient method will be established.

**Keywords:** chrome, plating, plastics, electrochemical, prototype

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In our study, nano-sized-metal organic frameworks (nano-MOF) were synthesized containing Copper based metal organic frameworks (Cu-based MOFs) using electrochemical technique. Voltage and electric current which are important parameters of the process were set to 3.0 V and 9.5 mA, and a homogeneously distributed nano-structured MOF was obtained. By using scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), X-ray powder diffraction (XRD), thermogravimetric analysis (TGA), Fourier-transform infrared spectroscopy (FT-IR), and atomic force microscopy (AFM) characterization techniques, the morphology, crystalline structure, thermal stability, molecular interactions, and surface topography of nano-MOF materials were analyzed, respectively. According to morphology results, the size of nano-MOF particles changes in the range of 30-90 nm. Based on EDS, XRD, and FTIR results, the structure of synthesized nano-MOF particles was chemically confirmed. Based on AFM results, homogeneous distribution of the particle size on the surface was observed. According to thermal analysis results, thermal degradation and thermal stability of synthesized nano-MOF structures were compared in detail.

**Keywords:** nanosized-MOF, morphology, nanoparticle, electrochemical technique
ID 138

Reusable Newly Fabricated Magnetic Monodisperse Gold Catalyst

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The objective of this study was to produce multifunctional microbeads for removal of environmental pollution. By this aim, the carbon based monodisperse porous support poly(mono-2-(methyleneoxy) ethyl succinate -co- glycerol dimethacrylate) “poly MMES-co-GDMA)” microbeads were synthesized approximately in 5µm. The specific surface area was determined with surface area and pore size analysis using BET method. Then, superparamagnetic iron oxide nanoparticles were synthesized with co-precipitation of iron salts, attached into these porous microbeads. Magnetic properties of microbeads were characterized with hysteresis curves. Magnetized microbeads were decorated by gold nanoparticles produce approximately 15nm in size. Obtained gold decorated micron sized catalyst material was characterized with scanning electron microscope (SEM-EDAX). The catalytic activity of newly fabricated gold decorated catalyst were determined by degradation of phenol derivative compounds.

Keywords: Gold Decoration, Nanoparticle, Magnetic, Reusable Catalyst

ID 140

Capability of Nanoscale Zero Valent Iron (nZVI)-Pumice for Methylene Blue Removal by Lab-Scale Mixed-Bed Column Reactor

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Nano zero-valent iron (nZVI) emerges as a cost-effective and environmentally friendly adsorbent to treat textile wastewater, which has dye content. However nZVI particles can easily agglomerate in aqueous environment due to electrostatic interaction, decreasing their treatment efficiency. Therefore pumice, a low-cost and naturally found porous material with lower specific surface area (2m2/gr), can be used as backfill material to reduce agglomeration of nZVI. Treatment efficiencies for pumice/nZVI packings (10:0 and 9:1 (w/w)) in column reactor for initial methylene blue concentrations of 25 and 100 mg/L were investigated in this study. Mixed bed column was run for 185 min and 60 min with 25 mg/L and 100 mg/L concentrations, respectively, until removal efficiency decreased to 90%. Also 50% removal was observed for mixed bed column with 25 mg/L and 100 mg/L at 235 min and 65 min, respectively, 90% removal for pumice only column was achieved at 87 min and 14 min with 25 mg/L and 100 mg/L concentrations, respectively. 50% removal was observed for pumice column with 25 mg/L and 100 mg/L at 111 min and 17 min, respectively. Mixed bed performed significantly better than pumice only column.

Keywords: Nano zero-valent iron, Methylene blue, Pumice, Mixed-bed column
Clinoptilolite is a HEU-type zeolite and consists of a two-dimensional pore system with three different channels having pore openings of $7.2 \times 4.4 \, \text{Å}$, $4.7 \times 4.1 \, \text{Å}$ and $5.5 \times 4.0 \, \text{Å}$, respectively. These channels are predominantly occupied by cations and H2O. In this study, clinoptilolite from Bigadiç sieved to pass through a $< 63 \, \mu \text{m}$ sieve. In order to investigate the changes in structural properties, clinoptilolite samples were treated with 100 ml and 1 M of KNO3, NaNO3, AgNO3, Ca(NO3)2, Mg(NO3)2 and HCl solutions at 90 oC during 3 h using batch method. Then, the cation exchanged samples were washed with hot distilled water several times and then dried at room temperature. Before the experimental procedure, all the samples were dried in an oven at 120 °C for 20 h and stored in a desiccator. Raw (CLN) and K+, Na+, Ag+, H+, Ca2+ and Mg2+ exchanged forms were characterized by X-ray diffraction (XRD) and N2 adsorption methods. The XRD patterns were obtained with a Bruker instrument, using CuKα radiation ($\lambda=1.54 \, \text{Å}$) at 40 kV and 40 mA, in the range 5-40 °2θ. BET surface area, micropore area and micropore volume of the natural and cation exchanged clinoptilolite samples were calculated.

**Keywords:** clinoptilolite; XRD; N2; adsorption
Montmorillonite, a member of the smectite group, is composed of an octahedral sheet sandwiched between two silica tetrahedral sheets. The rock in which these smectite minerals are dominant is bentonite. Most of the cations are found in the octahedral, tetrahedral, and interlayer positions. The isomorphic substitutions of Fe and Mg by Al in the octahedral sheet and Al by Si in the tetrahedral sheet lead to a negative charge density. This net positive charge deficiency is balanced by the exchangeable cations (Na+, K+, Mg2+ and Ca2+), which are absorbed between the 2:1 layers and around the edges. In order to determine the changes in structural properties, bentonite samples were treated with 100 ml of 1 M KNO3, LiNO3, AgNO3 and Mg(NO3)2 solutions at 90 °C during 4 h in a shaker. BET surface areas were calculated from the first part (0.05 < P/P0 < 0.35) of the N2 adsorption isotherms. All the samples were outgassed at 125 °C for 12 h prior to N2 and C2H4 adsorption measurements (using Autosorb 1 equipment). The C2H4 gas adsorption capacities of original and modified forms were found in the range of 1.817-0.201 mmol g⁻¹.

Keywords: bentonite; C2H4; N2; adsorption

Preparation and characterization of KFI zeolites and their mixed-matrix membranes

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With more than 200 known framework structures, zeolites present an attractive source for obtaining improved materials for separation/adsorption, catalysis and ion-exchange applications. Separation of CO2 from gas mixtures is a popular subject of investigation and different materials have been tested for this purpose. In this study, KFI zeolites with different Si/Al ratios were prepared by hydrothermal synthesis. Zeolite-polymer mixed matrix membranes containing KFI type zeolites were also prepared. KFI zeolite has pore size suitable for separating CO2 from various gas mixtures. Polyvinyl acetate was selected as the polymer phase due to its compatibility with zeolites in the mixed matrix membranes. The zeolites and membranes were characterized by using X-ray diffraction (XRD), scanning electron microscopy (SEM), carbon dioxide and nitrogen adsorption as well as thermogravimetry (TGA). The SEM pictures indicated a homogeneous distribution of zeolite particles in the mixed matrix membranes. Adsorption of CO2 and N2 in pure zeolite and polymer as well as mixed matrix membranes assured high selectivity of KFI zeolites for CO2. TGA results indicated that KFI type zeolites may also be useful under some conditions in adsorption heat pump applications related to their water sorption properties.

Keywords: Zeolite; mixed matrix membrane; characterization
ID 146

Investigation on The Usage Potential of Marble Sawing Dust in Porous Concrete Production

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Investigations on the usage of industrial waste materials in the construction material production are important for sustainable production and environmental protection. Turkey has important position for marble production in the world. Cutting of the marble blocks and sizing generates important amount of fine marble powder waste. There is only limited usage of this waste powders. This study was mainly focused on the usage potential of this waste in porous construction material.

Foam concrete is one type of light weight concrete and foaming agents (chemicals) were used for making porous. Natural silica sand is used as a main raw material in traditional aerated concrete production. Aluminum powder is used for pore generation. However, foam concrete production is becoming more favorable in recent years due to several advantages. Waste marble sawing powders and Portland cement were used as main raw materials. H2O2 was used as chemical foaming agent and KMnO4 was the catalyzer. Effect of catalyzer amount on the foam stability and foaming was investigated under constant water/powder ratio. Physical, mechanical and microstructural investigations were performed on the porous samples. It was concluded that waste marble powders can be utilized in foam concrete production.

Keywords: Foam concrete, marble waste, foam stability, properties

ID 147

Reaction Bonded Boron Carbide for Armor Applications

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Hard ceramics are playing an ever-growing role in armor applications. Among them, boron carbide (B4C) is highly ranked due to its high hardness and low density. On the other hand, since it is more expensive than competitor ceramics when raw powder and production costs are taken into account, new ways of making a cheaper and competitive product is an active research area. Reaction bonding (reaction sintering) production method offers low temperature processing and complex shape manufacturing compared to hot-press and pressureless sintering methods. In this study, we explored the effect of SiC addition to our reaction-bonded boron carbide (RBBC) recipe to make our product more cost-efficient. We investigated the effect of changing the starting powder composition (both the amount and particle size of the SiC powder) on the physico-mechanical properties of the final product. We performed optical and SEM micro-structure visualisations, three point bending tests, ballistic testing of the bare ceramic and ceramic-composite structures along with the CT-scans to see the changes in the product. The newly developed recipe is found to offer about 15% reduction in the production costs with a negligible deterioration in the ballistic performance of the ceramic armor product.

Keywords: reaction bonded boron carbide, silicon carbide, armor, ballistic
Thermal and Spectroscopic Properties of Natural and Modified Sepiolite

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Sepiolite is among the world’s most important industrial minerals. It consists of double silica tetrahedral chains linked together by octahedral oxygen and hydroxyl groups containing Al and Mg ions in a chainlike inverted structure. These inverted tetrahedral occur regularly and cause channels through the structure. In this study, sepiolite (from Eskişehir) sieved to pass through a < 63 µm sieve. Sepiolite samples were treated with 100 ml of KNO3, NaNO3, AgNO3 Ca(NO3)2, Mg(NO3)2 and HCl solutions at 90 oC during 3 hours using batch method. After the treatments, samples were washed with hot distilled water many times and then dried at room temperature. Then, all the sepiolite samples were dried in an oven at 120 °C for 20 h and stored in a desiccator. Effect of cation exchange on the thermal and spectroscopic properties of sepiolite samples were investigated by TG, DTA and FT-IR methods. Simultaneous TG and DTA experiments were performed using a Setsys Evolution Setaram thermal analyzer. Infrared spectra of the natural and modified sepiolite samples were recorded (4000–400 cm-1) with a Bruker Optics IFS66v=s FTIR spectrometer at a resolution of 2 cm-1 using the KBr pellet technique.

Keywords: sepiolite; TG, DTA; FT-IR

Development of T1 Relaxation Times for Clay Samples

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Clays are widely used to a lot of different area such as industry, chemistry, pharmacy, etc. However, it is difficult to characterize some materials such as clay and zeolite. Especially, because of the increase in relaxation time of Si and Al nuclei of clay, it is difficult to characterize these materials using solid state NMR spectroscopy. In the recent years, in order to decrease relaxation times of these materials, lots of ways have been suggested. Henceforth, in this work, Au, Ag, Ni, Co and Pd salts were adsorbed in channel and micro and mezo pores using chemical process and paramagnetic centers were provided in the clay. So, NMR acquisition times were reduced. After then, Al and Si NMR experiments were done and T1 relaxation times of these compounds were measured using saturation recovery methods. As a results, it shows that used Au, Ag, Ni, Co and Pd atoms were decrease to T1 relaxation times of Al and Si nuclei. Moreover, Au and Ag atoms were found as the best to decrease T1 values than the other atoms.

Keywords: Solid state NMR, clays, Al and Si NMR, T1 relaxation time
The field of nanotechnology involves developing a wide range of applications such as filtration, drug delivery, tissue engineering, protective clothing, electrical and optical, biomedical, cosmetic and energy applications. Reducing the fiber diameter into nanometer scale increases the surface-to-volume ratio of fibers and improves the mechanical properties of the fibers. As an unique alternative to traditional thermal insulating materials such as glass wool, glass nanofibers provides higher levels of thermal insulation. Nanoporous structure of glass nanofibers makes them highly thermal resistant materials. Compressing the air between the layers of nanofibers enhances the insulating facilities. Glass ceramic membranes that are manufactured from inorganic materials such as silica, titania, zirconia have high mechanical strength, high thermal and chemical resistance and stability. In this study, porous glass ceramic nanofibers in the system of SiO2-TiO2-ZrO2-CeO2 were fabricated by combined sol-gel and electrospinning methods. Sol-gel mixture and polyvinylpyrrolidone (PVP)/ethanol solution were prepared and then they mixed together. The obtained mixture was used to fabricate nanofibers by electrospinning method. After calcination process produced nanofibers were investigated by using SEM, FTIR, XRD and BET analyses. It was concluded that the nanocomposite fiber may be possible candidates for the industrial applications as an insulating material.

**Keywords:** Nanocomposite, glass, polymer, insulating material

In this study, micro-nanoporous TiO2 films were prepared by electrochemical anodization of titanium (Gr-2) in an aqueous solution containing 0.5 wt. % HF solution at a constant potential of 30 V and then annealed in ambient air at 500, 600, 700 and 800 °C for 2 h to obtain crystalline structures. The crystalline phase and surface morphology of the samples were characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The photocatalytic performances of the samples were evaluated by the photocatalytic degradation of aqueous methylene blue (MB) solutions under UV light illumination for different periods. XRD results indicated that at annealing temperatures higher than 600°C, anatase started to transform into rutile. Increasing annealing temperatures resulted in reduced micro-nanopores diameter and increased wall thickness. At 800°C, the structure completely disappeared. The results demonstrated that changes in both the crystalline structure and surface morphology have a strong influence on the photoactivity of the nanostructured TiO2 films.

**Keywords:** Nanostructured TiO2; anatase; surface morphology; photocatalytic; methylene blue.
ID 155
Oxidation of thymol and carvacrol to thymoquinone with KHSO5 catalyzed by iron porphyrin tetracarboxylate based homogeneous and porous heterogeneous catalyst
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The chemical transformation of abundant and cheap natural products is a convenient way to produce more valuable and useful compounds. Thymoquinone is one of such compounds and can be produced from thymol and carvacrol which found in the essential oils of many aromatic plants. Recently, some publications have dealt with the antitumor and hepatoprotective activity of thymoquinone, as well as with its use as an inhibitor of the membrane lipid peroxidation. Since the natural resource of thymoquinone is limited only certain plants such as Nigella sativa, Callitris articulata and Monarda fistulosa, there is a growing interest for its production from other chemicals. In this study, water soluble meso-carboxyphenyl porphyrin iron (II) [FeTCPP] and its porous heterogenous derivative was prepared for the use of oxidation thymol and carvacrol. The product compositions of the reaction mixtures were identified using GC-MS and/or NMR tecniques and amounts of the products were calculated using GC chromatograms. The major product of the reactions was thymoquinone (2-isopropyl-5-methylbenzoquinone, TQ). In order to improve recycling number of the catalyst, we synthesized porous heterogeneous catalyst including PCN222(Fe)/MOF545(Fe).

Keywords: iron porphyrin tetracarboxylate, PCN222(Fe), thymol, carvacrol, thymoquinone, oxidation

ID 156
Design of Paper Based Bone and Bone Marrow Interface Model
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Cancer-and-bone models to study cancer cell nature in the bone environment are very important to follow disease progression and develop therapeutic strategies. There are several models and biomaterials used for this purpose such as hydrogels with and without hydroxy apetite, polymers reinforced with bioglass nanoparticles, polycaprolactone-tricalcium phosphate and silk fibroin scaffolds. Recent studies show that paper is a favorable biomaterial for bone model structure that allows biomineralization of MLO-A5 osteoblasts. Additionally, paper has been used for studying the human lung cancer (VXN2s) migration, 3D behavior of MDA-MB-231 cells and evaluating chemotaxis of cancer cells in gradient of oxygen. In this study, it is aimed to develop a layered bone model with grade 114 Whatman paper (average pore size of 25 µm, 190 µm thickness) in order to investigate the invasion of MDA-MB-231 breast cancer cells within the bone cells. This model can be used as a new methodology to study cancer invasion for further studies. Results show that D1-ORL-UVA mouse bone marrow derived mesenchymal stem cells can be cultured on paper for 3 weeks without any cytotoxic effect.

Keywords: Whatman paper, cancer-and-bone model, invasion
ID 157

**Improvement of Plasma Torch Geometry by CFD For Metal Powder Production**
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In this study, design changes were made to develop a non-transferred plasma torches used to produce metal powder by plasma atomization. In a high-efficiency plasma torch, the gas velocity and temperature must be as high as possible at the plasma jet. High velocity and temperature values are obtained due to the arc-root attachment in the nozzle. However, in the plasma atomization process these values must be carried as far as possible from the nozzle exit. The most effective parameters on this case are gas flow rate, current density and design changes. For this reason, the effect of gas flow rate, current density on the gas velocity and temperature in the plasma jet is primarily investigated parametrically. Afterwards geometry changes were made on the basis of the most suitable parameters obtained. Numerical solutions of the calculated fluid dynamics are given and analysis results are given to determine the most suitable working conditions. The results showed that, the internal geometry has significant effect on the plasma jet temperature and velocity at the outside of the torch and this effect is more important than gas flow rate and current density.

**Keywords:** plasma, torch design, powder production

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ID 158

**Fabrication of Porous Apatite-Wollastonite Glass Ceramic Using Pressureles Sintering**
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This research project is concerned with applying the manufacturing process of pressureless sintering to a new bioactive glass-ceramic apatite-wollastonite (A-W) which has excellent bioactivity and mechanical properties. The aim of this work was to produce porous bioactive glass-ceramic A-W components via pressureless sintering (PS) and to assess their suitability for use in bone replacement applications. Apatite-Wollastonite glass based on the system MgO·SiO2·P2O5·CaO·CaF2 was produced. Apatite-Wollastonite (A-W) Polyvinyl chloride (PVC) and Poly (methyl methacrylate) (PMMA) were used to fabricate bonelike scaffolds material using the burning out method. Compression tests were carried out in order to assess the effect of Apatite-Wollastonite on the compressive strength of the scaffolds, and porosity measurements were taken to provide open porosity values. Scanning Electron Microscope images were used to investigate the effect of the pore distributions on the microstructure of each scaffold. Results suggested that the optimal scaffold was made up of 70% A-W, 30% PMMA as a good homogenous mixture was observed and both micro and macro pores were present.

**Keywords:** Bioceramics, Apatite Wolastinite (A-W), Sintering, Porous materials
Plasma torches are widely used in the industry. They are used as current technology especially in spray coating and metal powder production. The torch model is important for determining the arc-root attachment, which is the main wear point the early thermal fatigue, and the continuity of the arc root attachment, which greatly affects the stability of the jets in the plasma spray, the outlet temperature and speed. In this study, the non-transferred DC argon plasma torch is modelled with three-dimensional computational fluid dynamics. Argon was used as working gas. The temperature, velocity distribution, exit temperature, exit velocity and arc-root points in the torch were investigated using the boundary conditions. The changes in arc spring length and arc junction under these forces are investigated. The effects of current and volumetric currents on the arc-root attachment were evaluated. As a result, it has been seen that the arc connection point moves with a balance between hydrodynamic and electromagnetic forces. As the increased magnetic forces shift the arc connection to the torch input, the increased volumetric flow is observed to shift the arc connection point towards the torch output. The results were compared with the studies in the literature.

**Keywords:** plasma, torch, arc-root

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Metal injection moulding (MIM) is a novel technology for producing near-net shape intricate parts cost-effectively. MIM comprises combined techniques of plastic injection moulding and powder metallurgy sintering. The present study focused on development of binder and fabrication of defect free MIM component and evaluation of wear resistance properties of Cr3C2-NiCr+NiCrSiB nickel base metal matrix composite. A wax-based binder system consisting of paraffin wax (PW), low density polyethylene (LDPE), polyethylene glycol (PEG-600) and stearic acid was established for metal injection moulding of Cr3C2-NiCr+NiCrSiB powder. The injection temperature was determined from the rheological investigation of the feedstock having the powder loading of 56 percent by volume. The sintering process has been performed with temperature cycle in the range of 1250–1300°C under vacuum with hydrogen purged atmosphere. The MIM components showed good mechanical properties and shrinkage in linear dimensions between 18 and 21%. Composites are characterised with respect to thermal properties and microstructure by scanning electron microscopy. The wear behaviour of metal injection moulded (MIM) Cr3C2-NiCr+NiCrSiB was studied using a pin-on-disc apparatus with alumina disc under dry sliding conditions at room temperature and elevated temperatures of 200 and 400°C.

**Keywords:** Metal Injection moulding, microstructure, Cr3C2-NiCr, NiCrSiB, adhesive wear
ID 162
Numerical Analyses of Coupled Heat and Mass Transfer in an Adsorbent Bed by Using LTE and LTNE Approaches
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Increasing energy consumption emerges the need for utilization of renewable energy sources and waste heat of processes more efficiently. Regarding this need, adsorption based cooling and refrigeration systems become a promising alternative of the conventional vapor compression based systems. The core component of an adsorption based cooling and refrigeration system is the adsorbent bed, which is a porous structure, constructed by packing adsorbent particles. Research activities in the field, mainly focus on increasing the efficiency of adsorption based systems, therefore accurate mathematical modeling of the adsorbent bed would be helpful to understand and evaluate the effect of parameters on the adsorbent bed design and operation. In the scope of this study two different heat transfer modeling approaches that can be used for the numerical analyses of coupled heat and mass transfer within the bed, will be presented. The first one is the Local Thermal Equilibrium (LTE) approach, in which both vapor and solid phases are assumed to be in thermal equilibrium. The second one is the Local Thermal Non-Equilibrium (LTNE) approach in which vapor and solid phases are assumed to be at different temperature. The results obtained from numerical analyses of a generic adsorbent bed geometry will be given in comparison.

Keywords: Porous media, numerical analysis, heat and mass transfer

ID 164
Self-assemble of PMMA Spheres for Silica Based Inverse Opal Production by Spin Coating Method
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In this study, spin coating method is used to assemble polymethyl methacrylate (PMMA) spheres with different process parameters such as coating times and speeds. The obtained PMMA colloidal crystals used as template, which is burned out after sol-gel infiltration. Sol-gel infiltration of silica precursor-based solution was carried out for inverse opal photonic crystal structure. Photonic characterization was carried out by UV-Vis spectrophotometer. Scanning electron microscope (SEM) is used for microstructural characterization in terms of colloidal crystal order and inverse opal structure.

Keywords: Self-assemble, PMMA, inverse opal, photonic crystal, spin coating
The pollution of water sources with endocrine disrupting chemicals (EDCs) has received scientific and public importance over the past decade since EDCs have been proved to be harmful to humans even under a trace level of exposure. Bisphenol A (BPA) is a well-known EDC and can cause diverse cellular responses even at low doses. Regarding the widespread usage of BPA as the monomer for the production of polycarbonate plastics, it is very crucial to develop efficient and sustainable treatment technologies to remove BPA released to aquatic environment through various industrial processes. Nanostructured TiO2 is one of the most effective materials used in advanced oxidation processes. However, TiO2 particles will agglomerate and sink in water due to the high density and this will decrease the ability of the UV light to reach the active sites on the photocatalyst particles. In this study, nanosized TiO2 particles were immobilized on the shell of the emulsion having an oil phase in the core via membrane emulsification and Pickering emulsion ways. These methods to produce the novel floating photocatalytic composites coated with TiO2 nanoparticles suggest a new approach for the development of an efficient composite photocatalyst for degradation of any organic toxic species. In real applications, photodegradation efficiency could be also affected by coexisting substances in natural waters, such as humic acid, inorganic cations and anions rather than initial concentration of solution, dosage of photocatalyst, and pH of solution. In this work, photocatalytic potential of floating composite particles was investigated in the presence of humic acid, several inorganic anions and cations along with H2O2 for degradation of BPA.

Keywords: BPA, photocatalytic degradation, Pickering Emulsion, TiO2

1-dimensional photonic crystal structure is produced by using sol-gel technique in order to obtain structural colors. Tetraethyl orthosilicate (TEOS) and Titanium isopropoxide (TTIP) precursors are used to build up SiO2-TiO2 multilayers by spin coating of solutions. Phase analysis was performed by X-Ray Diffraction meter (XRD). Surface morphology of obtained structures were observed by Scanning Electron Microscope (SEM). The effect of thickness and numbers of layers on optical properties of the resultant structures were investigated by and UV-Vis photospectroscopy.

Keywords: Structural color, 1-dimensional photonic crystal, multilayers, sol-gel
Production of ZA27 Foam by Powder Metallurgy Technique

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ZA27 foams were produced by powder metallurgy process from gas atomized ZA27 alloy powders and spherical carbamide space holder route. ZA27 foam samples with 20-60% porosity were produced. Effect of relative density on the compression properties of ZA27 foams was evaluated and its micro-architectural characteristics such as cell size, shape, porosity and cell wall thickness of foams were investigated by stereo and scanning electron microscope (SEM).

Keywords: ZA27 foam, powder metallurgy, carbamide space holder

Black Coating On Porous Silica For Application To Adsorbent

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This paper introduces a new type of black materials-porous silica composites exhibiting high selectivity in a column separation. The black composites were prepared by one-pot copolymerization of dihydroxynaphthalene and triazine derivatives on porous silica microspheres in a simple solvent system such as ethanol and subsequent blackening with proper heat treatment. The advantages of our method can be emphasized by the facts that any surface modification of the base silica is not needed before the hybridization process, and the pore size and high surface area of the base silica are well-maintained after the hybridization and blackening processes. The structure of the black layer on silica was estimated to be amorphous carbon-like substance according to UV-visible, NMR and Raman spectroscopies. When the obtained black silica was applied for a column separation, the retentivity and selectivity were extremely enhanced by the blackening. In this paper, we also demonstrate good applicability of our method in black coating for other porous materials such as diatomites.
Novel zwitter ionic polymer-grafted porous silica microspheres (Sil-VP+ES-n) were prepared by quaternization of poly(4-vinylpyridine)-grafted porous silica microspheres with sodium 2-bromoethanesulfonate. Since the surface charge of Sil-VP+ES-33 was positive in lower pH and negative in higher pH, it was expected that the terminally grafted-polymer chain probably retained its flexibility. Sil-VP+ES-n showed good performance as HPLC stationary phase in hydrophilic interaction liquid chromatography (HILIC) mode. High selective separations were achieved for bio-related hydrophilic molecules such as nucleobases and nucleosides. The observed separation factors with Sil-VP+ES-n were higher than those with conventional sulfobetaine-based monomeric twitter ion-grafted porous silica. It was suspected that such high selectivity was brought about by multiple interactions between zwitter ionic groups based on the flexible polymer chains. These results suggest the potential of zwitter ionic polymer-grafted porous silica microspheres in the recognition of large size molecules such as polypeptides, polysaccharides and polynucleotides.

**Keywords:** HILIC mode separation, HPLC stationary phase

Recently, microsphere with wrinkled surface have been attracting much attention because of its unique morphological features and large specific surface area. Such microspheres having wrinkled surface are expected to be used in a wide range of application fields such as optical materials, electronics materials, biomaterials and scaffold for cell cultivation. Several methods such as chemical oxidation and UV irradiation have been reported to create wrinkled-surface on the surface of polymer materials. In this paper, we report the preparation of microspherical polymer particles with wrinkled-structure on the surface of core-shell microspheres with silica nanoparticles-layered shell by modified suspension polymerization of monomer droplet containing silica nanoparticles. It was expected that the wrinkled-surface was formed by the formation of the hard skin layer through crosslinking of silica nanoparticles at the surface of microsphere, followed by the shrinking of core volume caused by the polymerization of monomer inside of microspheres. The surface morphology of core-shell microspheres could be controlled by changing the size and the concentration of silica nanoparticles in monomer dispersion.

**Keywords:** Wrinkled surface, Core-Shell microsphere
Preparation of hollow silica microspheres having bumpy structures on inner- and outer-surfaces
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Hollow microspheres are useful to various applications such as drug delivery, thermal insulation materials, optoelectronic materials and coatings. Recently, we have reported the core-shell microspheres having silica nanoparticles-layered shell on polymer core. The surface morphology of the core-shell microspheres can be controlled by changing of size and packing density of silica nanoparticles. In this paper, we introduce the hollow silica microspheres with bumpy structures on inner- and outer-surface, which are prepared by connecting the nanoparticles on the surface of core polymer using via sol-gel reaction of tetraethoxysilane followed by removal of core polymer by calcination. The shell composed of silica-connected silica nanoparticles was kept its spherical morphology even after calcination, and the characteristic surface morphologies with projections were conclusively obtained on inner- and outer-surface. The mechanical strength measurements revealed that the compression modulus of hollow silica microspheres was increased with increasing of the thickness of silica layer. Rapid heating of hollow silica microspheres with thin silica connecting-layer led cracking of the silica shell, in which the cracks were mostly observed at the connecting-layer between silica nanoparticles. Such characteristic of the hollow microspheres is useful for the capsule with heat-induced explosion property caused by internal pressure changes.
Keywords: Hollow silica microsphere, bumpy surface

Porous Chitosan/Marble Powder Composite Beads as a New Green Adsorbent for Dye Adsorption
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The aim of the present work was to synthesize chitosan/marble powder composite beads as a low-cost and ecofriendly adsorbent and investigate its dye adsorption properties. The adsorbent was characterized by Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR) before and after the adsorption process. For adsorption study, Dimozol Yellow (DY), a synthetic textile dye, was used. The effect of contact time, adsorbent dosage, pH, adsorbate concentration and temperature on the adsorption capacity of the chitosan/marble powder composite beads was investigated. The prepared chitosan/marble powder composite beads showed around 93.0 % removal percentage of DY adsorption within 72 hours with maximum adsorption capacity up to 27.9 mg/g. The adsorption isotherms, kinetics and thermodynamics for DY dye onto chitosan/marble powder composite beads were also investigated. The experimental results fitted Freundlich model and the pseudo-second order kinetic models well. The thermodynamics studies revealed that the adsorption processes were spontaneous and exothermic in nature. The results suggested that chitosan/marble powder composite beads have potential applications in the field of wastewater treatment.
Keywords: Porous beads; Adsorption; Dimozol Yellow; Marble Powder; Kinetics
Novel Efficient Pd-free Catalyst for Suzuki C-C Coupling Reaction: Sustainable and green protocol
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Suzuki cross-coupling reaction has become one of the most effectual approaches for the synthesis of biaryls or substituted aromatic moieties from aryl halides and arylboronic acids with a palladium-catalyst in the past two era’s. Compounds comprising biaryl assemblies are significant building blocks for polymers, natural products such as alkaloids, and several agrochemicals and biologically active pharmaceuticals. In the present study we introduce Pd-free layered double hydroxide containing nickel catalyst as an efficient alternative to the classical Pd-containing catalysts. The classical organic synthesis as well as the Ball-mill techniques were applied to synthesis various biaryls. High yield/selectivity for the desired products was obtained. The sustainability of both catalyst and the catalytic process should encouraging forthcoming in C-C coupling reactions.

Keywords: Nickel catalysts; Suzuki Coupling; Green protocol; Ball-milling

Preparation and characterisation of sericin stabilised silver nanoparticles
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Silver nanoparticles have been widely used in many fields such as textile, medical, electronic, cosmetic and food during the past few decades because of their unique biological, optical, electrical and catalytic properties. Studies have shown that the size, shape and the stability of nanoparticles influence these properties. The fabrication of silver nanoparticles with controlled features such as size, shape and stability has received great attention. The stabilisation of the silver nanoparticles is crucial for protecting the unique characteristics of the nanoparticles. Several stabilising materials have been used in the nanoparticle fabrication. The affinity of the stabiliser for Ag⁺ ions and metallic silver is an important parameter to control the stability. In this work, sericin, a nitrogen-rich biomaterial, from the cocoon shell was used as a stabiliser to maintain the colloidal stability. NaOH and NaBH₄ were used as reducing agents. The effects of reducing agents and temperature on the particle size and morphology were investigated. Characterisation results showed that spherical silver nanoparticles smaller than 100 nm were synthesised with both reducing agents. Silver nanoparticles were synthesised at room temperature by using NaBH₄. On the other hand, NaOH reduction is temperature-sensitive and could be achieved at temperatures higher than 60 °C.

Keywords: Cocoon shell, Sericin, Silver nanoparticles, Stabilisation,
ID 186

Gold nanoparticle decorated-magnetic catalyst for rapid reduction of 4-nitrophenol

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Phenol and derivatives are used in many fields such as chemical, paint, paper, pharmaceutical industry and explosives production units. These organic compounds which is even at very low concentrations are threatening aquatic organisms life. The degradation of these toxic waste in the nature is difficult and time-consuming and they must be removed from the environment. In this work, the plasmonic catalytic activity of 4-nitrophenol was investigated by using gold nanoparticle (AuNP) decorated magnetic silica microbeads as catalyst in the presence of NaBH4 in batch fashion. Magnetic silica microbeads 5 µm in size functionalized with amine groups were synthesized with high surface area and good magnetic properties. They were used as support for immobilization of gold nanoparticles (Au NPs). The chemical, morphological and magnetic properties of the catalyst were analyzed by X-ray diffraction spectroscopy (XRD), Surface area and pore size analyzer, Vibrating sample magnetometer (VSM), Transmission electron microscopy (TEM) and Scanning electron microscopy (SEM). The reduction of 4-nitrophenol (4-NP) to 4-aminophenol (4-AP) was monitored using UV-Vis spectroscopy by changing the reaction parameters such as catalyst amount, Au loading, Au NP size, initial concentration of 4-NP and reaction temperature. The results showed that quantitative reduction of 4-NP was achieved by using AuNP decorated magnetic silica microbeads with the reaction times ranging between 5-30 min depending on the reaction conditions. It was demonstrated that the catalyst was recovered efficiently by magnetic separation and highly stable without exhibiting no significant activity decrease with the repeated use.

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Keywords: Sol-gel template, Plasmonic catalysis, 4-nitrophenol, Au decorated magnetic silica microbeads

ID 187

Comparing The Morphology Of Chitosan Nanoparticles Manufactured By Different Type Of Methods

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Chitosan is a highly favorable material to use in drug delivery applications due to its unique properties. It is difficult to produce nano-sized chitosan particles, with well-defined morphology and stability by using the classical gelation route. In this study, two types of production methods were used and their effects on the morphology of chitosan nanoparticles were investigated.

These methods were based on the enveloping of a lipophilic drug in the hydrophobic core of the micelles of P-123 (a block co-polymer) by thin-film hydration method and then chitosan molecules were polymerized around the micellar structures by ionic gelation. In Method-2, the first method was modified by dispersing the chitosan solution that contains drug loaded micelles, in an oil phase. The manufactured nanoparticles were characterized using scanning electron microscopy (SEM) and fourier transform infrared spectroscopy (FTIR). The particles were in the size range of 30 to 300 nanometers in the case of Method 1 and 50 nanometers in the case of Method-2. The size distribution of particles in case of Method-2 was narrow compare to the that of Method-1.

Keywords: chitosan, micelle(s), nanoparticle(s), drug delivery, hydrophobic drug
In recent years, composites of biopolymers and bioactive glasses (BG) have been developed as bone-repairing devices because of their bioactivity, biocompatibility and biodegradability. The desirable combination of biocompatibility of biodegradable polymers and the bioactivity of BG can be achieved by preparation of porous polymer/BG composites by different methods. However, the need for advanced scaffold systems has compelled the addition of different functionalities (bioactivity, mechanical competence, growth factor or drug delivery, antioxidative effects, angiogenic potential and antibacterial behavior) into the substrates to be able to mimic the natural bone structure. In this study, it was aimed to produce BG/polymer 3D composite scaffolds with relevant ions in order to develop multifunctional scaffolds for bone tissue engineering. The scaffolds were fabricated by using solvent casting particle leaching technique. The bioactive glass in the system of SiO2-CaO-P2O5-Na2O-SrO was produced by classical-melting method. BG and Cu nanoparticles obtained by chemical reduction using microwave irradiation method were introduced into the scaffolds. Microstructural, physical and biological properties of the produced scaffolds were determined. The effects of BG particles and relevant ions were investigated in terms of the structural, physical, and biological behavior of composite scaffolds. It was observed that there was a good pore interconnectivity maintained in the scaffold microstructure. It was also determined that the scaffolds can deliver controlled doses of strontium and copper toward the SBF medium that is the determinant for bone tissue regeneration.

**Keywords:** Scaffold, bioactive glass, therapeutic ions, nanoparticle, bone tissue engineering

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The selective catalytic reduction of NO with CH4 over functionalized AlMCM-41 has been studied. Factors such as platinum rate exchange (0.5-4.0 wt %), temperature (100-800°C), GHSV (8000-16000 h⁻¹) and CH4/O2 ratio (0.25-2.0) have been investigated. The highest NO reduction rate was found at a stoichiometric ratio of CH4/NO equals 2, at 350°C, 2.5 wt% of platinum and a GHSV of 12000 h⁻¹. The rate of intermediate N2O reduction is minimal at high CH4 pressures. The reaction product suggests a short NO2 lifetime. The NO/NO2 oxidation/reduction cycle delays NO reduction to N2 until all O2 is consumed under helium flow. For Pt(X)-catalysts, the NO maximum conversion depends on the factors mentioned above and on aging steam. Then, for high oxygen concentrations (at 350°C), catalyst Pt (2.5 wt%)-H-AlMCM-41 shows a good NO reduction. The presence of Pt ions, oxidation states and their uniform dispersion within the catalysts affect positively this reaction. It was observed that the specific catalytic behaviors of the prepared materials sharply decreased when O2 increased with a steam aging temperature ≥ 600°C. Studied factors induced the formation of octahedral aluminum due to a dealumination phenomenon which leads to a structural collapse and a loss of activity.

**Keywords:** AlMCM-41 materials, functionalization, Selective Catalytic, NO Reduction, Pt loading
Selective catalysis (hydrocracking/hydroisomerization) of n-C10 was studied over functionalized AlMCM-41 with platinum rate exchange (0.5 - 4 Wt %) and ammonium ions (95%). In the present work, the n-alkanes (nC10) underwent conversion with bi-functional catalysts Pt/H-AlMCM-41. The tests were carried out in a continuous fixed bed reactor under the following conditions of atmospheric pressure, ratio alkanes/H2 5:1, temperature (up to 600°C), acidity, and space velocity (0.1 h⁻¹<WHSV<1.1 h⁻¹). Relatively high yields of light products were obtained. Ptn+/H-AlMCM-41 Catalysts showed a good catalytic activity. The study revealed bimodal distribution; the adsorption of n-alkanes on acids sites and then their subsequent conversion. Thus; this phenomenon is improved by the textural/structural characteristics and (Ptn+/H) bi-functionalization, responsible for the acidity on the inner surface of catalysts. This work has established a close relationship between structure, selectivity, activity and acidity of functionalized AlMCM-41. The nature and distribution of the obtained products suggest that the bi-functional catalysts show a good performance and better selectivity in cracking reactions than hydroisomerization with its accompanying steric effects biased for multi-branched products.

Keywords: AlMCM-41 materials, acidity, functionalization, hydroisomerization/ hydrocracking
Porous carbonaceous adsorbents such as biomass-based materials are useful for wastewater treatments in terms of their high capacity, natural abundant availability and low cost compared with commercial adsorbents. In this study, char obtained from pyrolysis of Verbascum was used for the removal of heavy metals from aqueous solutions. Pyrolysis experiments were conducted in a free-fall reactor at 500ºC with a heating rate of 10 ºC/min in the presence of nitrogen atmosphere with a flow rate of 200 cm³/min. The effects of initial metal ion concentration and contact time on the adsorption process were investigated and the results were compared with commercial activated carbon. Experimental data were modeled by Langmuir, Freundlich, Temkin and Dubinin-Radushkevich (D-R) isotherm models. Experimental results showed that the pyrolysis by-product bio-char can be evaluated as an alternative and effective adsorbent for removal of low-concentrated heavy metal ions from aqueous solutions.

**Keywords:** Verbascum, pyrolysis, biomass, bio-char, adsorption

Pretreatment of biomass prior to the pyrolysis process has been shown to alter the structure and chemical composition of biomass. This method provides the potential to vary bio-oil composition for specific applications and to enhance surface morphology of the solid carbonaceous product. In this study, rice husk was treated by a hydrothermal process using several concentrations of dilute and strong acids. Physical and chemical characteristics were determined in order to determine the effect of the pre-treatment on the yield and composition of the pyrolysis products. Characterization studies showed that pretreatment conditions have a significant effect on the removal of inorganics from biomass and on the porosity development by changing the surface from macroporous to the meso-microporous structure. On the other hand, the yield of valuable products in the bio-oil is increased by the hydrothermal treatment.

**Keywords:** Rice husk, Pretreatment, hydrothermal, sulfuric acid, biomass, pyrolysis
ID 201

**Producing activated carbons with enhanced porosity from Pinus pinea cone via chemical activation**

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Activated carbons (AC) are porous materials with high surface areas and have been prepared from various amorphous carbon-based materials like plant biomasses. Due to their chemical nature and porous structure, activated carbons have been widely used as adsorbents, separation substrates, and catalysts or catalyst supports. In this study, the feasibility of preparing activated carbons from Pinus Pinea cone was studied. The influence of borax and boric acid impregnation on the porosity and quality of carbons were investigated. For characterization, ASTM standards were used to carry out proximate analysis and adsorption-desorption isotherms were used to determine specific surface area, pore volume, and micro-mesoporosity. Adsorptive removal of phenol from aqueous solutions was also studied with the char and activated carbons, and a proper model was selected for the adsorption isotherm.

**Keywords:** Pinus Pinea cone, chemical activation, activated carbon, phenol adsorption

ID 203

**Recycling of waste from the ceramic industry as an active cementitious addition**

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The use of industrial residues in construction, as a partial cement replacement, solves a two-fold problem: economic and ecological, on the one hand to reduce the cost price of cement and in other hand to minimize greenhouse gas emissions, this results in the production of a less polluting and environmentally sustainable material. The objective of this work is to study the possibility of partial replacement of the cement by the brick waste in the mortar and to study its effect on the physicochemical and mechanical properties in the anhydrous and hydrated state. Mortars with different substitution rates (0%, 10%, 20% and 30%) and with different grain sizes (≤ 100 μm, ≤ 80 μm, ≤ 63 μm) are studied This study showed satisfactory results of the physical properties compared to the control mortar; the mechanical properties show that the compressive strength at 28 days of the mortar with 10% waste substitution and a grain sizes of 63 μm is very close to that obtained by the reference mortar.

**Keywords:** Pozzolanic addition, activity, brick waste, cement, physico-mechanical and chemical properties
ID 206

Growth of Hybrid TiO2 Mesoporous/ZnO Nanowire Arrays and Their Optoelectronic and Photovoltaic Properties

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Growth of ZnO nanowires within TiO2 mesoporous structures are carried out by hydrothermal method. Structural, optical and thermal characterizations have been carried out by SEM, XRD, EDAX, DTG, TG, PL and UV-vis spectroscopy. XRD characterization shows that the all diffraction peaks of the tandem nanostructures films can be well indexed to a mixture of hexagonal Wurzite ZnO and anatase TiO2 structures. The UV-Visible absorbance spectrum indicate that the tandem nanostructures based on TiO2 mesoporous/ZnO nanowire arrays have 3.13 eV band gap energy while pure ZnO nanowire and bare TiO2 mesoporous shows 3.37 eV and 3.22 eV band gap energy, respectively. The PL spectra of tandem nanostructures shows that the UV, violet, and yellow emission peaks appeared at 3.1 eV, 2.6 eV and 2.3 eV, respectively. It has been shown that from the PL spectra, the enhanced ultraviolet emission of TiO2/ZnO tandem structures is related the fluorescence resonance energy transfer between TiO2 mesoporous and ZnO nanowires. Thermogravimetric analysis from room temperature to 800°C has been performed to identify the thermal stability and the amount of tandem TiO2/ZnO structures.

Keywords: Tandem Nanostructures, TiO2 mesoporous/ZnO nanowire Arrays, Hydrothermal Process, PL of TiO2/ZnO tandem nanostructures

ID 207

Carbon Fiber Based WO3 Nanoparticles Decorated on Highly Porous TiO2 Nanostructures to Improve Photocatalysis and Solar Cell Efficiency

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Carbon fiber based WO3–TiO2 nanocomposites were synthesized with carbon fiber loadings from 3 to 10 wt% via in situ process by solvothermal method. Porous Carbon Fiber/WO3 and their composite with titanium dioxide (TiO2) particles (Degussa P25) were investigated as a photoanode for dye-sensitized solar cells. The enhancement of efficiency was mainly attributed to increase in current density (Jsc) and improvement in fill factor (FF). Increase in Jsc was caused by higher dye loading as indicated by UV–Vis absorption spectra and the improvement in FF was attributed to faster charge transport time as obtained from transient analysis. The CF@WO3@TiO2 heterostructures had large specific surface areas, high porous structure and excellent interface (between WO3 nanoparticles and TiO2 anatase). We also showed that the new material (CF@WO3@TiO2 heterostructures) had a wide range of light absorption and demonstrated the best photocatalytic performance. The possible growth mechanism and reasons for high photocatalysis are discussed in detail.

Keywords: Carbon Fiber, WO3–TiO2 nanocomposites, TiO2 mesoporous, Solar Efficiency
ID 208
Atomic Layer Deposition (ALD) of Metal Nanoparticles onto Free-standing and Flexible Electrospun Polymeric Nanofibrous Webs for Catalytic Application
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This study reports the surface functionalization of electrospun polymeric nanofibers with platinum nanoparticles (Pt-NP) and palladium nanoparticles (Pd-NP) by atomic layer deposition (ALD) technique for catalyst. Herein, flexible electrospun polymeric nanofibrous webs were successfully decorated with monodispersed Pt and Pd NP with ultra-low dimension (~2 nm) through ALD. The display of monodisperse metal (Pt and Pd) nanostructures with the exposure of (111) plane exhibited the single faceted crystal nature. The uniqueness of the deposition process leads to control the density of metal NP on the polymeric nanofibers with the monodispersed nature. Pt and Pd NP loaded flexible polymeric membranes were exhibit the strong catalytic behavior for the hydrogenation of nitrophenol to aminophenol. Moreover, the catalysts were exhibited good stability over the reusable cycles up to 5 cycles and easy to recover. Our results suggest that Pt-NP or Pd-NP decorated polymeric nanofibrous webs are promising as catalyst materials along with structural flexibility and stability. Acknowledgement: The Scientific and Technological Research Council of Turkey (TUBITAK, project #115Z488) is acknowledged for funding the research.
Keywords: ALD, nanofibers, catalysis, metal nanoparticles, electrospinning

ID 209
Copper oxide thin film and mesoporous ZnO as a barrier in dye-sensitized solar cells
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The mesoporous ZnO dye-sensitized solar cells (DSSCs) with different pore radius were studied on the effect of CuO layer as a barrier layer toward power conversion characteristics. CuO nanostructures were prepared by hydrothermal method and oxidation reaction of copper powder and CuO thin film prepared by evaporation copper thin film, were used as a layer on the top of ZnO layer to form blocking layer. The photocurrent, photovoltage and power conversion efficiency characteristics for DSSCs were measured under illumination of simulated sunlight obtained from a solar simulator with the radiant power of 100 mW/cm2. It was found that ZnO DSSCs with CuO thin film exhibited highest solar conversion efficiency of \( \eta = 5.10\% \) as dependent on porous radius. The enhancement of the power conversion efficiency can be explained in terms of the retardation of the interfacial recombination dynamics of CuO blocking layer into the porous structures.
Keywords: CuO nanostructures, Mesoporous ZnO, Dye Sensitized Solar Cell, Hydrothermal Growth
ID 210
Surface Modification Of Carbon Based solid Product Obtained From End-Of-Life-Tyres Via Chemical Degradation
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Carbon is having one of the unique characteristic to exist in a number of allotropic forms, with remarkably varying chemical and physical properties due to the diverse nature of chemical bonds and arrangement of carbon atoms in 3D (diamond), 2D m(Graphite), and 1D (carbine). The surface modification of carbon materials is of great importance in a wide variety of fields, such as adsorption chemistry, electrochemistry, microelectronics and super capacitor. In this study, the chemical degradation experiments of waste tire rubbers crumb were carried out in the reaction vessel by using inorganic and organic chemicals in different amounts to decompose easily on account of cross-linking and stabilizers at three reaction temperatures in the range of 130 – 150 °C under atmospheric pressure. After chemical degradation, the solid and liquid phases were separated by filtration. The obtained solid product (SP) was activated by using 1 M HCl, 1 M NaOH chemical activating agents. After that, Activated SP was carbonized with heating of 10 °C/min. at temperature of 550 °C and 3 hours carbonization time under nitrogen atmosphere. The elemental composition, chemical and physical properties of SP were characterized by Fourier Transform Infrared Spectroscopy FT-IR(Perkin Elmer Spectrum 100) and X-Ray Diffraction XRD (Panalytical Empyrean diffractometer). Moreover, BET surface area and microstructure properties of SP and carbonized SP were characterized by Scanning Electron Microscopy (SEM-ZEISS Supra 40VP) and N2 gas adsorption isotherms(Micromeritics ASAP 2020), respectively.

Keywords: End-of-Life-Tyres, waste tyre, chemical degradation, carbon based solid product

ID 211
Structural Characterization Of High Energy Density Life(X)Mn(1-X)Po4/C Composite Nanofibers For Secondary Lithium Batteries
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Olivine type lithium metal phosphate compounds have recently received increased attention as very promising cathode materials for rechargeable lithium-ion batteries because of their stability, non-toxicity, low cost, and excellent performance. Electrospinning has been demonstrated as an effective way to improve the electrochemical performance of electrode materials. In this study, we present a scalable synthesis of porous LiFe(x)Mn(1-x)PO4/C composite nanofibers in two-step process (heat treatment followed by electrospinning). Structural characterization of LiFe(x)Mn(1-x)PO4/C composite nanofibers with different Fe/Mn ratios were made by using x-ray diffraction analysis. According to Rietveld refinement results, all samples showed olivine-type structure.

Keywords: electrospinning, LiFe(x)Mn(1-x)PO4, lithium-ion batteries, X-ray diffraction
Synthesize And Characterization Of Sic Nanoparticles By Mechanical Milling Technique

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Mechanical milling can be used to quickly and easily synthesize a variety of micro and nano ceramic particles which are very difficult to manufacture by other techniques. In this study, synthesis of SiC nanoparticles by mechanical milling at three different milling speeds and milling times was studied in order to investigate the effect of mechanical milling process on the particle size and morphology. The morphology and particle size of micro and nano SiC particles were characterized by using scanning electron microscopy and a laser particle size analyzer, respectively. It was found that a high milling speed and longer milling time are required for the conversion from micro-sized powders to nano-sized powders. A particle size of nano SiC particles decreased with increasing milling speed (from 100 to 300 rpm) and milling time (from 1 to 5h). It should be noted that the particle size of the SiC powders was effectively can be reduced to size of nanoscale by using optimal milling parameters.

Keywords: Mechanical milling, nano size, milling speed, milling time

Application of artificial neural network for prediction of coating thickness in Fe-Al coatings

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In this study, the applicability of artificial neural network (ANN) for the prediction of the coating thickness in Fe-Al coatings fabricated by mechanical alloying technique is presented. Coating morphology was investigated using a scanning electron microscope (SEM). It was observed that an increase in the milling time provided an increase in the coating layer thickness due to the cold welding process between particles and the steel substrate. The input parameters of the ANN model are the milling speed (rpm), the particle size (μm) and the milling time. The output parameter of the prediction model is the coating thickness. As a result of this study, the ANN was found to be successful for predicting the coating thickness of Fe-Al intermetallic coatings. Comparison of experimental and predicted values using the proposed ANN model shows that there is a good agreement between them. The mean absolute percentage error (MAPE) for the predicted values didn’t exceed 7.46%.

Keywords: Artificial neural network; Fe-Al coating; thickness; mechanical alloying
The Effect Of Process Parameters On Specific Surface Area Of B4C Powders In Mechanical Milling
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In this work, the effects of milling parameters on specific surface area of B4C powders produced by high energy ball milling were determined by the response surface method. Response surface method was used to optimize of milling parameters: milling time, ball to powder ratio and milling speed. Specific surface area of B4C powders (m2/gr) was used to evaluate the effect of milling parameters on the high energy ball milling process. The orthogonal array experiment is conducted to economically obtain the response measurements. Analysis of variance (ANOVA) and main effect plot are used to determine the significant parameters and set the optimal level for each parameter. The results show that the ball to powder ratio and milling speed were the most relevant parameters to maximize specific surface area. 

Keywords: Powder metallurgy, specific surface area, high energy ball milling, response surface method.

Determining of the effect of heat treatment parameter on the grain size of AISI 316L stainless steel using Taguchi method
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The effect of heat treatment parameter on the grain size of the 316 L stainless steels were investigated for this experiment. Heat treatment process of the 316 L stainless steels was carried out and compared according to Taguchi design. An orthogonal array exhibited and examined the influencing parameters like austenitization temperature, waiting time and cooling medium on the grain size of the 316 L stainless steels. Scanning electron microscopy (SEM) was used for characterization of heat treated 316 L stainless steels. Analysis of variance (ANOVA) and main effect plot are used to determine the significant parameters and set the optimal level for each parameter. The ANOVA results indicate that the austenitization temperature was the most relevant parameter to minimize on the grain size of the 316 L stainless steels.

Keywords: AISI 316L stainless steel, heat treatment, optimization
The characterization of Al-Cu-Mg/B4C nanocomposites produced flake powder metallurgy

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Metal matrix nanocomposites have been developed and are being used across all segments of the industry due to its superior physical and mechanical properties. In this work, Al-Cu-Mg/B4C alloy matrix nanocomposites were prepared by flake powder metallurgy method. The effect of flake powder metallurgy on the density and hardness of B4C nanoparticle-reinforced Al-Cu-Mg alloy matrix composites was investigated. Flake powder metallurgy was assisted by using a short-term ball milling, which resulted in improved homogeneity of the B4C nanoparticle distribution. For 1h of flake time, as the B4C nanoparticle content gets smaller from 1 to 5 wt%, density reduces from 2.7733 to 2.7350 g/cm³ and hardness increases from 117.11 to 125.21 BHN. Moreover, as the initial particle size of Al-Cu-Mg alloy matrix increases, density and hardness decrease due to agglomeration effect.

Keywords: Flake powder metallurgy, Nanocomposites, Al-Cu-Mg alloy, Boron carbide

A Review on The Powder Coating with Mechanical Milling

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Mechanical milling is a powder processing technique that facilitates the synthesis of homogeneous materials from powder mixtures. The surface of the balls and the inner walls of the vial are continuously impacted by the balls and powder particles, resulting in their being coated by the milled powder. A thin layer prevents excessive wear on the grinding medium, a thick layer results in structural inhomogeneity that is difficult to remove from the surface. The process can also be used to produce surface coatings on ball-milled components. In this paper, the effects of the powder type, process parameters and production method are critically reviewed and their potential as use of modern coated surfaces on is evaluated.

Keywords: Mechanical Milling, Coating
ID 218

Fabrication of Al2O3 nano-powders by a planetary ball milling without process control agent

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Nano-sized Al2O3 ceramic particles were produced by a planetary ball milling using micron-sized initial Al2O3 particles without the process control agent and their milling behavior was examined as a function of the milling time and ball to powder ratio. The morphology and particle size of micro and nano SiC particles were characterized by using scanning electron microscopy and a laser particle size analyzer, respectively. In the particle size distribution analysis, the smallest d50 was investigated. Fine and nano Al2O3 particles were obtained as a result of ball milling process. Morphology and particle size studies of milled particles showed that the particle size continuously decreases with increasing milling time. It was found that the higher ball to powder ratio provides more homogeneous particle refinement by introducing high impact energy of balls during the milling process. An important decrease in particle size is noted as the ball to powder ratio increases from 5:1 to 15:1.

Keywords: Ball milling, nano particle, ball to powder ratio, milling time

ID 219

Prediction of the effect of matrix size and milling time on the particle size of flake Al-Cu-Mg alloy particles using neural networks

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In this work, the effect of matrix size and milling time on the particle size of flake Al-Cu-Mg alloy powders was investigated both by experimental and artificial neural networks model. Flake Al-Cu-Mg alloy powder was prepared by using ball milling technique. For the fabrication of the flake Al-Cu-Mg alloy powders, four different matrix sizes (28, 60, 100 and 160 μm) and five different milling times (0.5, 1, 1.5, 2 and 2.5h) were selected. A feed forward back propagation artificial neural network (ANN) system was used to predict the properties of flake Al-Cu-Mg alloy powders. It was observed that flake size of the coarse initial Al-Cu-Mg alloy powders were higher as compared to those of the fine initial Al-Cu-Mg alloy powders. For training process, the ANN models of the flake size have the mean square error of 0.66 %. The degrees of accuracy of the prediction models were 95.145 % for the flake size.

Keywords: Artificial neural network; flake size; Al-Cu-Mg alloy, ball milling
The electrical contact materials are widely used for electrical applications such as switches, relays, contactors and industrial controls, which have an important influence on the reliability and stability of overall electrical systems. This paper presents a summary of work reported on electrical contact materials fabricated different materials and fabrication methods. The influences of selected materials on the electrical conductivity, arc erosion wear and hardness as well as microstructure are summarized. It was reported that the electrical contact materials can be categorized as Ag and copper based electrical contact materials in terms of pure metals. Moreover, conductivity and other properties of and Ag and copper matrix composite contact materials are discussed in this review. The review presents: (i) an introduction of electrical contact materials; (ii) an investigation of physical and mechanical properties of pure metal and composite electrical contact materials and (iii) a comprehensive comparison of fabrication methods of electrical contact materials.

Keywords: Electrical contact materials, copper, silver, powder metallurgy, Casting

The catalytic performances of LaBO3 (B: Fe, Co, Mn, Ni) perovskite catalysts in Fenton-like oxidation of the textile dye, Reactive Black 5 were compared, and, the optimum reaction conditions were investigated in the presence of the most efficient catalyst. Reactive Black 5 was selected as the model dye due to its complex chemical structure, high water solubility and common usage in the textile industry. The performances of the catalysts in Reactive Black 5 degradation and decolorization were compared by testing different catalyst loadings. According to the catalyst screening experiments, LaFeO3 showed the highest catalytic performance whereas LaCoO3, LaMnO3, and, LaNiO3 were not effective in the degradation and decolorization of Reactive Black 5. A parametric study was carried out in the presence of LaFeO3 catalyst in order to determine the most suitable reaction conditions. In the parametric study, the effect of catalyst loading, pH and the initial H2O2 concentration were investigated. The initial dye concentration and the reaction temperature were fixed constant at 100 ppm and 50°C, respectively. The most suitable reaction conditions were determined as 0.1 g/L of catalyst loading, 3 and 1 mM of H2O2, and, 96.9% degradation, and complete decolorization were achieved under these conditions.

Keywords: Textile Dye, Perovskite Catalyst, Fenton-like Oxidation
ID 223

Biological properties of Cu-based porous bioceramic coatings formed on zirconium by plasma electrolytic oxidation and thermal evaporation

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The commercial pure zirconium was coated by plasma electrolytic oxidation in solution, consisting of calcium acetate and β-calcium glycerophosphate salt. Then, Cu thin film layer that had an average thickness of 20 nm was deposited by thermal evaporation. Phase structure, surface morphology, elemental composition and wettability of both coatings were characterized by powder and TF-XRD, SEM, EDS-mapping and contact angle goniometer, respectively. The XRD results indicated that cubic-zirconia, calcium zirconate and hydroxyapatite were detected on the surface after PEO and PEO+TE. Both coating surfaces were rough and porous. The Cu-based coating was hydrophobic compared to PEO coating. After TE process, Cu was homogeneously distributed on the surface. The biological properties such as bioactivity and antibacterial tests of the coatings were analyzed by immersion test in SBF and bacterial formation. The apatite-forming abilities of both coatings were evaluated after immersion in SBF up to 10 days. After immersion, apatite structure was formed on the Cu-coated and uncoated PEO surface and the bioactivity of both PEO surfaces on Zr was significantly improved under SBF conditions. The homogenous and dense apatite distribution was observed on Cu-based PEO coatings. The bacterial adhesion of Cu-based PEO coatings was significantly reduced compared to plain PEO surface.

Keywords: Anti-bacterial properties; bioactivity; apatite; bioceramic coatings; plasma electrolytic oxidation (PEO); thermal evaporation (TE).

ID 224

NON-LINEAR MODELING OF CEMENT GRINDING PROCESS

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The cement industry is an energy-intensive industry like the iron-steel, petrochemical and paper industries. Today, the production capacities of many cement producers are limited by the energy demand. It is possible to increase the production capacity only by reducing the energy requirement. The ball mill grinding is the highest energy consuming process of cement production. The objective of this study is to identify the ball mill grinding process using non-linear modeling in order to obtain the best possible blaine quality estimation so that a supervisory control system can be designed to achieve the lowest energy consumption. Conventional modeling techniques are insufficient due to the process delays, variations on many operating and process parameters, disturbances etc, so in this study, the effects of various linear and non-linear modeling techniques on identification of the ball mill grinding process was investigated. Also, the genetic algorithm was used to optimize the best set of delays (for each inputs and output), model order and other configurable model parameters in each modeling techniques. It has been shown that the prediction of blaine quality with Hammerstein-Wiener Model in this study is a very promising system identification technique for the ball mill grinding process and other applications.

Keywords: Cement Grinding Process, Hammerstein-Wiener Model, Industrial Control, Non-Linear Modeling
Silica aerogels are unique nano-porous materials which have extraordinary properties such as high specific surface area (100-200 m²/g), high porosity (>90%), low density (0.01-0.03 g/cm³). The most common technique used for producing silica aerogel is the sol-gel method that involves supercritical drying (SCD) at the final stage which is very expensive and risky process due to high pressure requirements. The desired forms of aerogels such as powder, granular and monolith, depend on to a large extent on the processing and drying conditions. In recent years, most of the studies have been focused on the producing aerogel in ambient condition drying (ACD) to overcome the limitations of SCD in terms of cost and safety. Most of the monolithic form of silica aerogels produced by ambient drying are notably weak and fragile that highly restricts the industrial application of these materials. However it is not a very easy issue as unavoidable crack formation occurs on the sample surface due to the capillary forces. In this study, it is aimed to produce monolithic silica aerogels in crack free form dried under the ambient conditions to investigate the effect of different parameters on the physicochemical and morphological properties of the final product. To accomplish this, ionic liquids (ILs) as a green chemical solvents were used in the sol gel process and incorporated into the aerogel structure. It is expected ionic liquids to serve as porogenic agent, beside to promote spring-back effect as the solvent evaporation. The type of sol precursors (Tetraethyl orthosilicate-TEOS, 3-Aminopropyl)triethoxysilane- APTES) and catalysts (acid and/or base) and aging time were taken as process parameters. Surface modifications by using metacrylate silica (MEMO) were applied to transform the sample into hydrophobic behaviour. The effect of the process parameters on the morphological structure of the silica aerogel were investigated by SEM analysis and chemical structures were investigated by FTIR and EDX analysis. As a result, desired monolithic form of silica aerogel was obtained as in the Figure 1. Volumetric ratio of the sol components (TEOS:APTES:IL:Ethanol) to acheive desired form was determined as 1:1:0.6:4.6, respectively. It can be concluded that ionic liquid is one the most crucial component in imparting monolithic form and flexibility to the silica aerogels during ambient.

Keywords: silica aerogel; ionic liquid; ambient drying

Silver nanoparticles (Ag-NPs) have been obtained by using electrodeposition method on n-type porous silicon (PSi) under different current densities, deposition times and concentrations of AgNO₃ solutions. The influence of Ag-NPs on the structural and photoluminescence properties of PSi/Ag has been studied by using SEM, XRD, Raman and photoluminescence spectroscopy. SEM analysis has shown that the shape and size of Ag-NPs significantly depend on the current density, deposition time and concentration. In short deposition times and low current densities, spherical Ag-NPs have been obtained, whereas, Ag dendrite nanostructures have been formed in long deposition times and high current densities. Raman signals of PSi/Ag have been dramatically affected by the shape and size of Ag-NPs. With increasing deposition time and current density, PL intensity of PSi/Ag nanostructures considerably increases, with respect to PL intensity of PSI. However, for the longer deposition times, the PL intensity of PSi/Ag dendrites significantly decreases due to the autoextinction phenomenon[1]. The improved PL intensity of PSi/Ag nanostructures can be explained by the quantum confinement effect and surface plasmon resonance model of coupled Ag-NPs[2]. Our results suggest that the unique and tailored properties of PSi/Ag nanostructures make them ideal for numerous applications, including optical and sensor devices[3].

Keywords: Porous silicon, silver nanoparticles, photoluminescence
Synthesis, Characterization And Antimicrobial Effect Of Phenolic Acid Loaded Alginate-Chitosan Nanoparticles

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Search of the new antimicrobials have a great deal of importance, because of the global increase of the antibiotic resistance of the pathogenic bacteria. Phenolic acids such as 3-hydroxyphenylacetic acid (3-HPAA) and 4-hydroxybenzoic acid (4-HBA) are promising antimicrobial agents. Since the stability of the phenolic acids could be decreased due to environmental factors, encapsulation is a promising technique for long term usage. Alginate (anionic polymer) and chitosan (cationic polymer) are biodegradable, biocompatible and non-toxic polymers. Antimicrobial property of chitosan is an advantage for antimicrobial effect of alginate chitosan (Alg-Chi) nanoparticles. In this study, Alg-Chi nanoparticles were synthesized as null (without any antimicrobial agent), as 3-hydroxyphenylacetic acid (3-HPAA) loaded (3 mg/ml) and as 4-hydroxybenzoic acid (4-HBA) loaded (2.8 mg/ml). These nanoparticles were then characterized by using dynamic light scattering (DLS) and scanning electron microscopy (SEM). Based on the UV-visible spectrophotometry results (270 nm for 3-HPAA, 250 nm for 4-HBA), the phenolic acids were encapsulated into the nanoparticles with 92% and 98% efficiency for 3-HPAA and 4-HBA respectively. The antimicrobial effects of 3-HPAA and 4-HBA loaded nanoparticles were tested on various nosocomial and food-borne pathogens.

Keywords: Alginate, chitosan, nanoparticle, phenolic acid, pathogen, antimicrobial

Characterization of Fracture Toughness Properties of nanostitched / Nanoprepreg Composites

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The mode-I interlaminar fracture toughness properties based on the double cantilever beam test of multilayered stitched carbon/epoxy/multiwall carbon nanotube prepreg woven composites were investigated. The fracture toughness, based on beam theory and modified beam theory, of the stitched/nano and stitched composites showed 2 fold and 3 fold increases compared to the base and base/nano composites, respectively. It was found that stitching yarn type, especially prepreg para-aramid stitching yarn, was effective. The fracture toughness resistance to arrest crack propagation in the stitched/nano composite was primarily due to out-of-plane directional stitching fiber bridging and was secondarily due to in-plane directional biaxial fiber bridging and multiwall carbon nanotubes. The fracture surfaces of the stitched/nano and stitched structures had multiple matrix and brittle tensile filament breakages in carbon stitching yarn and ductile filament breakages in the para-aramid stitching yarns where filament/matrix debonding and filament pull-out were identified. The results demonstrated that stitching and the nanotubes arrested the crack propagation. Therefore, the biaxial stitched/nano and stitched carbon/epoxy woven composites showed a better damage resistance performance compared to those of the base (unstitched) or base/nano (unstitched/nano) composites.

Keywords: PAN carbon fibers, Para-aramid fibers, Multiwall carbon nanotubes, Fracture toughness, Double cantilever beam (DCB) test, Nanostitching.
ID 231

Catalytic Conversion of Glucose Over Chromium Doped Montmorillonite
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The doped montmorillonite catalyst was prepared by wet impregnation methods using Cr(NO3)3 and was characterized by BET, and XRD. Catalytic hydrolysis were carried out in a high temperature-high pressure stainless steel reactor (Parr, USA) in the temperatures of 160-180 and 200 ºC. Samples were taken at the time interval of 30-60-90-120-150-180-240-360 minutes. Compositions of liquid products were analyzed by high-performance liquid chromatography (HPLC). This study showed that Cr-MMT can be useful for conversion of glucose in the water media. Reaction temperature dramatically affected the glucose conversion. It was elevated from 48.33% to 91.79 % when the reaction temperature increased from 160 to 200 ºC. HMF yield was also increased from 3.05 to 31% for 30 minutes, but as the time increased at higher temperature HMF yield was decreased due to the conversion of HMF to levulinic acid. Reaction time was increased the HMF yield at the 160 and 180 ºC reaction temperature, however it was decreased by time at 200 ºC. Catalyst loading was also effective parameter for glucose conversion. Levulinic acid production was also increased with time and it was maximized (7.07%) at 150 minutes (180 ºC, 2/1 catalyst/glucose ratio). Acknowledgement: This study was supported by Anadolu University Scientific Research Projects Commission under the grant no: 1502F080

Keywords: Glucose, Hydroxymethylfurfural, Catalytic conversion, Impregnation

ID 232

Characterization and removal of antibiotic residues by N-F-C doped photocatalytic oxidation from domestic and industrial secondary treated wastewaters in Meric-Ergene Basin
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Antibiotics, which are the important contaminants that have become increasingly problematic due to discharge to the receiving environment. The presence of these organic based pollutants in influent wastewater can inhibit the biological processes and resists to degradation in wastewater treatment plants. Moreover, the consumption of agricultural products, irrigated with water containing antibiotic residues, leads to major harmful effects to the human body through the food chain. In this context; a conventional characterization was made in terms of COD, TOC, SS, color and antibiotic residues of untreated raw wastewater from Domestic and Industrial Wastewater Treatment Plants located in the Meriç-Ergene Basin. Erythromycin, Ciprofloxacin, Sulphametoxasol, detected by HPLC MS/MS in excess amount, were selected for the photocatalytic oxidation process under visible light. After that, a new generation NFC-doped titanium dioxide photocatalyst, which has never been studied in the literature before, was prepared according to the sol-gel method. All analyzes were made according to the Standard Methods. Investigated domestic wastewaters exhibited moderate characteristics, while industrial wastewater samples had strong characteristics in terms of COD, TOC and SS pollution in accordance with the literature. It has been revealed that although high COD, TOC, SS and color removal were obtained, antibiotic removal could not be achieved by means of biological conventional systems. Measurement results of the antibiotic residue quantities, carried out by HPLC MS / MS, have been proved that the influent wastewater contains more antibiotics than the effluent wastewater despite biological process applied at the treatment plants. This can be explained by the fact that, some antibiotics in domestic wastewaters are probably already trapped in feces and cannot be purified by conventional systems because just after biological treatment they are released, as mentioned in similar studies in the literature. Successfully, %99 to %100 antibiotic residue removal was provided by means of 7 hours N-F-C doped photocatalytic oxidation under visible light with approximately %70 to %87 COD and TOC removal at the same time. Acknowledgement; This paper was funded by the Scientific Research Council of Namik Kemal University via Grant No. NKUBAP.06.GA.16.053

Keywords: Heterogeneous Photocatalytic Semiconductor, N-F-C Doped TiO2 Photocatalyst, Advanced Oxidation Processes, UV, Domestic / Industrial Wastewater, Wastewaters containing Antibiotic, Resistant and Recalcitrant Pollutant Compounds
Copper Oxide-Carbon Fiber Nanocomposites for Efficient Visible Light Induced Photocatalysis

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Photocatalytic treatment is one of the efficient ways to reduce contamination of water. Copper oxide (CuO) is a promising semiconductor due to its low cost, high photostability, ease of synthesis, and non-toxicity. However, it may suffer from fast recombination rate of photogenerated electron-hole pairs in consequence of thin band gap, resulting in hindering photocatalytic activity. To overcome this problem, carbonaceous structures are good candidates to improve the photocatalytic activity by reducing the recombination of holes and electrons. Carbon nanofibers (CNF) have pointed out as a support material due to their good stability, their high surface area caused by the prismatic planes on the nanofibers surface. Herein, CNF based CuO catalysts were prepared by hydrothermal method. The catalysts with different weight ratios of CNF were characterized by FTIR, SEM, XPS, and UV–vis spectroscopy. The photocatalytic performances of the CuO/CNF catalysts were evaluated in decoloration of Orange II dye under visible-light irradiation. The effects of initial concentration of the dye concentration, carbon fiber ratio and catalyst dosage were investigated. The photocatalytic activity of CuO/CNF was found superior when compared with raw CuO catalyst and the Orange II photodegradation increased from 21.1% to 47.5% under visible irradiation.

Keywords: Copper oxide, Carbon Fiber, photocatalysis

Nano Zinc Borate as a Lubricant Additive

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Lubricants consist of base oils and chemical additives such as dispersants, surfactants, oxidation inhibitors, and antiwear agents. Organic and inorganic boron-based additives increase wear resistance and decreases friction. Hexagonal boron nitride and metal borates are used for this purpose. Zinc borate is a synthetic hydrated metal borate. The production techniques of zinc borate generally include the reaction between zinc source materials (zinc oxide, zinc salts, zinc hydroxide) and the boron source materials (boric acid and borax). The nano zinc borate particles were prepared from zinc nitrate and borax in the present study by using low initial zinc and borate concentrations and low temperature to prevent particle growth. The templates span 60 and PEG 4000 were used to control the particle size. The particles were separated from mother liquor by centrifugation, washed with ethanol, dried and ground and used as additive to base oil. The particles have H2O and B(3)-O vibrations in their FTIR spectra. The empirical formula of the nanoparticles was approximately 3ZnO.2B2O3.4H2O from EDX and TGA analysis. X-ray diffraction diagram indicated the particles were in amorphous state. When the nanoparticles were added to light neutral oil the wear scar diameter and friction coefficient was lowered 50% and 20% respectively.

Keywords: lubricant additives, zinc borates, wear scar, friction
Uranium plays a central role in the nuclear industry, which has emerged as pollutant of the environment because of its long life time, as well as highly radiological and biological toxicity. Removal and recovery of uranium are a popular research area for scientists. Adsorption is the most preferred method to remove uranium from wastewaters due to feasibility and cost. Vermiculite is a kind of layered aluminium silicate with high specific surface area and adsorbing ability. Chitosan is known as a cheap, eco-friendly and efficient biosorbent. In this study, chitosan-vermiculite composite beads were synthesized by crosslinking them with epichlorohydrin and sodium tripolyphosphate and the material was used as a potential adsorbent for removal of $\text{UO}_2^{2+}$ ions. Adsorption of $\text{UO}_2^{2+}$ ions from aqueous solution as a function of ion concentration, pH, time, temperature, ionic strength, and reusability of adsorbent was investigated. The adsorption data were analysed, evaluated by conventional models. The maximum adsorption capacity of adsorbent was calculated as 0.795 mol kg$^{-1}$ based on Langmuir model.

**Keywords**: Chitosan, Vermiculite, Composite Beads, Uranly, Adsorption

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Turkey has large marble deposits and plenty of marble production and processing plants which consume enormous amount of water. Waste materials, especially sawing dusts accumulate in large pools with processing water, cause environmental problems. In this research, waste marble material collected from a marble plant as pulp was treated to obtained clear water and valuable marble powder. The solid/liquid separation was made by sedimentation method in which a number of electrolytes and polyelectrolytes used as coagulants or flocculants. As an alternative fly ash, from Elbistan (Turkey) coal power plant, was also tested. Settling velocity of the powders in the aqueous medium were measured in a graduated cylinder and the clarity of the water aliquot was determined by a turbidimetry. The effect of different dosages of reagents and different sizes and amounts of fly ash were investigated in the tests and the results were compared. Test results showed that a small amount of fly ash was enough to separate solid powder and obtain clear water efficiently. Finer sizes of fly ash were found more efficient in separation. It is considered that the fly-ash, as a pozzolan, reacted with powders to produce calcium silicate hydrate in the aqueous medium and settled faster. Hence, the obtained solid fraction can be used in cement production or other areas like road construction.

**Keywords**: fly ash, marble waste, sedimentation, pozzolan
Antimony exists in the environment in mainly two oxidation states: Sb(III) and Sb(V). Both Sb(III) and Sb(V) ions hydrolyze easily in aqueous solution, thus making it difficult to keep antimony ions stable in solution except in highly acidic media. Although Sb(III) compounds are 10 times more toxic than Sb(V) compounds, the mobility and solubility of Sb(V) are greater than Sb(III). In this work strongly acidic cation exchange resin (Purolite PFC 100) and iminodiacetate containing chelating resin (Lewatit TP 207) were used for the removal of Sb3+ from aqueous solution. According to kinetic data, removal of Sb3+ from aqueous solution by TP 207 resin is faster than removal by PFC 100 resin. The sorption of Sb3+ on such resins are followed by pseudo-second-order kinetic (R² >0.99). Thermodynamic results reveal that the sorption of Sb3+ onto such resins is exothermic and spontaneous process. The sorption data fit with Freundlich isotherm model. Obtained results indicated that TP 207 resin showed better removal performance than PFC 100 resin.

Acknowledgment: This study has been supported by The Scientific and Technological Research Council of Turkey (Program code: 2209). We thank to Purolite and Lewatit companies for resin samples.

Keywords: Antimony, Ion exchange resin, Lewatit TP 207, Purolite PFC 100

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A citrate loaded anion exchange (Finex AS150GC) and acetate containing weakly acidic cation exchange resin (Finex CA16GC) were tested for removal of Cu2+. The kinetics, equilibrium and thermodynamics of the sorption Cu2+ onto such chromatographic resins were investigated under different experimental conditions. The equilibrium sorption experiments showed that, in acidic solution removal performance of these resins are low. The kinetics of such resins are fast. In 60 minutes more than 95% of Cu2+ removed from solution. The Langmuir (R² > 0.9900) isotherm model was the best fitted model compared with the Freundlich model (R²:0.9800). The kinetic data were fitted well with the pseudo-first-order model for AS150GC and pseudo-second-order model for CA16GC resin. The maximum sorption capacity was 52.5 mg g⁻¹ for AS150GC and 26.8 mg g⁻¹ for CA16GC. Regeneration experiments showed that, sorbed Cu2+ can be removed from resin by 0.1 M HCl solution. Acknowledgment: This study has been supported by The Scientific and Technological Research Council of Turkey (Program code: 2209). We thank to Finex company for resin samples.

Keywords: Copper removal, Ion exchange, Finex AS150GC, Finex CA16GC
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Removal of Tartaric acid from water by iron-oxide loaded anion exchange resin
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Tartaric acid is present in almost all fruits, but it is especially common in grapes. This organic compound can be synthesized in the laboratory but, due to economic reasons, it is usually obtained from fruit wastes, grapes spirit, crude argols, lees, etc. In this work; model tartaric acid solutions were prepared for evaluation of iron-oxide loaded anion exchange resin (Purolite, FerrIXA33E) on tartaric acid removal in a batch type system. The effect of resin dose, initial solution pH, temperature on the removal of tartaric acid was tested. Results showed that, sorption processes exhibited a spontaneous and endothermic nature. Besides, the removal performances fitted with the Langmuir isotherm model and pseudo-second order kinetic model very well. The equilibrium was reached in 90 min, The maximum sorption amounts of tartaric acid 110.86 mg/g respectively. Regeneration of resin was also tested. Obtained results indicated that, tartrate loaded resin can be regenerated by 0.5 M NaCl with 97% efficiency.

Acknowledgment: We would like to acknowledge Purolite Int. Co. for ion-exchange resin sample.

Keywords: Ion exchange, Tartaric Acid, Purolite, FerrIXA33E

ID 240

Enhanced electrokinetic properties and antimicrobial activities of biodegradable chitosan/organo-bentonite composites
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In this study, chitosan (CS), bentonite (Na+-BNT) and chitosan/organo-bentonite (CS/O-BNT) biodegradable composites having three different compositions were investigated. Electrokinetic measurements were examined in aqueous medium by taking the effects pH, electrolytes (NaCl and BaCl2), surfactants (CTAB and SDS), and temperature into account. It was noticed that the initial ζ-potential of Na+-BNT shifted from negative (ζ=-35 mV) to positive region (ζ=+13 mV) with increasing polycationic CS content in the composite structure as aimed. Divalent 2:1 electrolyte caused to shift the ζ-potentials of all the dispersions to more positive regions. While the most negative effect on ζ-potential of the composites was reached with SDS, which reduced the value of ζ-potential to -39 mV for CS(1)/O-BNT composite, the most positive effect was monitored with CTAB (ζ=+40 mV) for CS(3)/O-BNT composite. Further, the composites were tested against various bacterial (Gram-positive and Gram-negative) and fungal microorganisms at various concentrations and results obtained were compared with the reference antibiotics and fungicide. According to inhibition zone values accomplished, antibacterial and antifungal activities of the CS/O-BNT composites are increased with increasing CS content as proportional with their positive ζ-potential values.

Keywords: Zeta potential, Bentonite, Chitosan, Antimicrobial activity, Composite
The Effect of Water Vapor on Catalytic Activity of Sol-Gel Alumina in Selective Oxidation of H2S to Elemental Sulfur

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H2S gas, corrosive and toxic, is converted to elemental sulfur by the Claus process. The feed stream in this process contains significant amount of water. In this study, alumina materials were prepared by the classical (SG1) and modified (SG2) sol-gel procedures and tested for selective oxidation of H2S to elemental sulfur (H2S + 1/2O2 → S + H2O) in the presence of steam at 250°C. The activity tests were carried out in the presence of 2% and 6% vapor in the gas stream. At the beginning of the reaction tests, complete conversion of H2S was obtained with SG1 and SG2 alumina materials in the presence of water vapor. It was observed that H2S conversions obtained with SG1 and SG2 alumina materials decreased with increasing water content in the feed. However, very high (100 %) sulfur selectivity was obtained with both aluminas in the presence of steam. After reaction test, bulk structure of SG1 and SG2 aluminas containing both amorphous and γ-Al2O3 crystalline phases did not change while surface hydroxyl group disappeared due to adsorption of vapor on alumina during selective oxidation of H2S.

Acknowledgements: TUBITAK (114M185) is gratefully acknowledged.

Keywords: H2S selective oxidation, Alumina, sol-gel methods

Mimicking from Nature: Superhydrophobic and Superoleophobic Surfaces

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Mimicking from nature is an useful method to provide sustainable solutions to many industrial objectives by emulating nature’s time-tested patterns and strategies. Superhydrophobic (water repellent) surfaces have water contact angles larger than 150° on them and water drops roll off removing dust and other materials while a small tilt angle (less than 10°) is applied. Lotus leaves, butterfly wings and duck feathers are the examples showing this property in nature. Similarly, superoleophobic (oil repellent) surfaces are designed to remove hydrocarbon and oil drops from surfaces. Superhydrophobic surfaces can be formed; i-by creating high roughness in micro and/or nano scale on a hydrophobic material or; ii- coating a previously a micro/nano-structured surface with a hydrophobic low surface energy material. On the other hand, the manufacture of superoleophobic surfaces is more difficult because the surface tension of oils and hydrocarbons (20-25 mN/m) are much smaller than the surface tension of water (72.8 mN/m). In this presentation, the synthesis conditions and characterization methods for superhydrophobic and superoleophobic surfaces, as well as their new application fields in industry will be discussed.

Keywords: Biomimicry, superhydrophobic, superoleophobic surfaces
In the present work, we have successfully synthesized the undoped yttrium silicate (Y2O3: SiO2) bulk sample by using the sol gel method and nanopowder form was obtained by heating treatment at 1250°C for 12h. Structural and morphological analyses were investigated by using the X-Ray Diffraction, Scanning Electron Microscopy, Transmission Electron Microscopy and Energy-dispersive X-ray Spectroscopy techniques. The optical measurements of the sample were performed by using the luminescence spectroscopy technique. We have observed the white light emission from yttrium silicate nanopowder when it is excited with NIR beam of a diode laser (975 nm). The temperature dependence of white light intensity for undoped yttrium silicate nanopowder has been analyzed in a wide range of temperature from 10-20 K to 550 K under ~10-4 mbar pressure. We have characterized this emission by studying the characteristics of the spectra.

**Keyword:** Sol-gel, Yttrium Silicate, Luminescence Spectroscopy, Temperature dependence, White Light

We have investigated the upconversion luminescence properties of yttrium silicate (Y2O3: SiO2) nano powders doped with different concentrations (0.5%, 1% and 0.25 % per mole) of Thulium (III) (Tm3+) and codoped with Thulium (III) (Tm3+) and Neodymium(III)(Nd3+) rare earths. The samples were synthesized by using the sol gel method and powder forms were obtained by annealing them at 12500C during 12 h. Luminescence properties of single doped and codoped samples were investigated at room temperature and pressure. The emissions due to the energy transfers of appropriate dopants were observed when the samples were excited by the 808 nm light from a diode laser.

**Keywords:** Rare earths, Upconversion White Light, Sol-gel, Luminescence Spectroscopy
ID 251

Ionic Conductivity Of Sm Doped Ceria Synthesized By Different Combustion Methods
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The rare-earth doped ceria has been extensively investigated as electrolytes in intermediate operating temperature solid oxide fuel cells (SOFCs) because of high ionic conductivity at intermediate temperatures. The doped ceria-based solid electrolytes showing high ionic conductivity were: the yttria doped ceria (YDC), the gadolinia-doped ceria (GDC), the samaria-doped ceria (SDC) and others. The most studied electrolyte in the literature is samarium-doped cerium oxide, especially Ce0.80Sm0.20O1.90 [1,2]. In this study, samaria-doped ceria (Ce0.80Sm0.20O1.90.) particles were prepared by different combustion methods (citrate-nitrate, glycol nitrate, ure-nitrate, pechini) and investigated the effects of methods on the characteristic properties and ionic conductivity. The precursor particles were calcined at temperatures at 800 0 C at 5 hours and pellets were sintered at 1400 0 C at 6 hours. The samples were characterized by means of X-ray diffraction (XRD), scanning electron microscopy (SEM) and electrochemical impedance spectroscopy (EIS). The impedance spectroscopy of the sintered pellets was also performed in the 300-800 0C, in air. References: [1] M. Mogensen, N.M. Sammes, G.A. Tompsett, Solid State Ionics129 (2000)63–94. [2] D.Y. Chung, E.H. Lee, Microwave-induced combustion synthesis of Ce1-xSmxO2-x/2 powder and its characterization, J. Alloys Compd. 374 (2004) 69–73.

Keyword: Sm doped ceria, combustion methods, electrolyte

ID 252

Evaluation of color removal efficiency of biologically treated textile dyeing wastewater with natural and novel pre-hydrolysed coagulants
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In this study, jar test optimisation studies, using novel pre-hydrolysed (PACI, PAFCI, PFS and PFCl) and natural coagulants (Chitosan and starch), were performed for color removal from an aerobic treated textile wastewater which includes multiple dyes (indigo and reactive dyes). According to the experimental results; the total color value of biologically treated textile wastewater was measured as 73,2 m-1 which show strength color character. Furthermore, jar test optimisation results showed that coagulant dosages which provide the best colour removal for PACI, PAFCI, PFS (%10) and PFCl (%10), were determined as 80 mg/L, 10 mg/L , 3 mg/L and 40 mg/L, respectively, at pH 4 and pH 6,98 (real ww) with 2 mg/L Anionic Polyelectrolyte (APE). According to the jar test results carried out at these optimum dosages, while maximum color removal was determined as 97% on PAFCl, minimum removal as 23% for PFCl at pH4. On the other hand, COD removal was observed as 55 % at this maximum color removal. By the way, color removal efficiencies were determined in the range of 52-88% at the studies carried out with natural coagulant substances. But, this efficiency range was found to be lower than the maximum removal efficiency obtained for novel-prehydrolysed coagulants. When the experimental studies are evaluated; it has been found that as natural and novel pre-hydrolysed coagulant materials, PAFCI and chitosan are the best in terms of color removal from investigated textile wastewater.

Keywords: Natural coagulant, Novel pre-hydrolysed coagulant, Colour removal, Textile wastewater, PAFCI, Chitosan.
ID 253

Synthesis and Characterization of SBA-3 Silica Material

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High surface area and large pore volume of porous silica structures increase the importance of these materials day by day. The surface/volume relationship of such materials is important from a characteristic point of view. In addition, thermal and chemical stability of these silica materials support molecular catalysts. It is possible to consider that once synthesized, SBA-3 material, which has a mesoporous and regular hexagonal structure, can be used in areas such as catalyst and membrane applications by employing its functional properties. This study presents the synthesis and characterization of SBA-3 silica material. SBA-3 was synthesized in a controlled acid with a pH of 6.5-7, using cetyltrimethylammonium bromide (CTABr) as a cationic surfactant. Its prospective characterization using SEM, XRD, BET, FTIR, TGA analyses will be shown.

Keyword: Silica Materials, SBA-3, Characterization, Synthesis

ID 255

Micromorphological Approach to Biological Powders of Caryophyllaceae Family

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The Caryophyllaceae is a large, cosmopolitan family of 86 genera, and about 2200 species of annual or perennial herbs or subshrubs, rarely shrubs or small trees. Species of the Caryophyllaceae are mainly distributed in the temperate regions of the northern hemisphere with a centre in the Mediterranean and Irano-Turanian region. A number of genera occur predominantly in arid areas, few in higher altitudes of tropical mountains and in southern temperate regions. Biological powders of Caryophyllaceae, namely pollen grains are suboblate-subprolate. The exine structure is tectate, or rarely reticulate, and finely spinulose. Generally polyporate, or rarely tricolporate. Polyporate pollen is rare in Paronychioideae subfamily, with 6-14 pores. It is common, however, in Alsinoideae and Caryophylloideae subfamilies, with 12-40 pores in Alsinoideae, and 15-38 pores in Caryophylloideae. This study was carried out micromorphological structure of Caryophyllaceae, which includes over 470 species, of which 32 of the genera exist as native species in Turkey. Similarities and differences in pollen micromorphology of some important genus of this family have been pointed out about pollen type, dimension and ornamentation, exine structure and sculpture, operculum structure.

Keyword: Caryophyllaceae, biodiversity, pollen, scanning electron microscopy (SEM)
Boiling on Structures with pHMA and pPFDA coatings

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Heat and mass transfer and fluid flow in plain microchannel systems have been extensively studied in the last decade. There is a strong need for more sophisticated second generation microfluidic systems having enhanced surfaces to have a better performance. To address this need, polyhydroxyethylmethacrylate (pHEMA) and polyperfluorodecylacrylate (pPFDA) coatings on surfaces of plates and channels were used for pool boiling and flow boiling in this study. The coatings were accomplished with initiated chemical vapor deposition (iCVD) technique. De-ionized water was utilized as the working fluid. Experimental results obtained from coated plates were compared to their plain surface counterparts and heat transfer enhancements were deduced. In addition, the results were bolstered with visualization tests. Promising results were obtained from coated surfaces. iCVD was proven to be a very practical method for surface enhancement due to the obtained promising results.

Keywords: Boiling; pHMA coating; Heat Transfer Enhancement; iCVD

Microwave-assisted transformation of glucose into 5-HMF over Cr doped zeolite prepared by deposition–precipitation method

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Recently, synthesis of high-value-added chemicals from biomass has been extensively studied. The US Department of Energy (DOE) published two reports summarizing research needs for biomass derived materials. 5-HMF can be synthesized from C6 sugars with dehydration and converts to levulinic and formic acid. Clinoptilolite-supported chromium catalysts were prepared by the deposition–precipitation method. Clinoptilolite was pre-calcined at 200, 600 and 1000 °C. Chromium was precipitated on the support by addition of ammonia solution and the pH value of the solution was maintained at 10 for 1 h. The resulting solid was dried at 60 °C and post-calcined at different temperature. All catalysts were characterized by N2 adsorption/desorption and XRD. A microwave reactor (Ethos Easy, Milestone) was used for the dehydration experiments. 250 mg of glucose, 100 mg of catalyst, and 30 mL of water were added in a 100 mL reaction vessel. The mixture was heated under irradiation at 800 W with temperature controlled at 200 °C for 30 minutes. It is observed that pre-calcination temperature increase resulted in decreasing the glucose conversion and 5-HMF yield. Chromium uploading was increased both glucose conversion and 5-HMF yield. Increasing post-calcination temperature caused the 5-HMF yield to increase while glucose conversion was not changed.

Keywords: glucose, 5-HMF, deposition-precipitation, microwave
ID 260

Solid Phase Extraction and Determination by FAAS of Heavy Metals Using a New Synthesized Resin in Various Tea and Plant Samples

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In this study, a new resin, poly[2-(4-methoxyphenylamino)-2-oxoethyl methacrylate-co-divinylbenzene-vinylimidazole] (MPAEMA-co-DVB-co-VIM), was synthesized. The resin was characterized by elemental analyzer, scanning electron microscope (SEM), Infrared spectrometer (IR), X-ray diffractometer (XRD) and BET analysis. Resin was used as solid phase sorbent for the simultaneous separation/preconcentration of heavy metals from various tea and plant samples prior to their flame atomic absorption spectrometric determinations (FAAS). The experimental conditions of the solid phase extraction (SPE) method such as pH, sample volume, flow rates of sample and eluent, type, volume and concentration of eluent and interference ions were examined. The detection limits (DL) of the SPE method for heavy metals were found to be (3s/b) in the range of 0.9-4.0 µg L⁻¹ (n = 21) and the relative standard deviation (RSD) was obtained as ≤ 2% (n = 11). The preconcentration factor was calculated as 50 for chromium, manganese, lead and 200 for cadmium, cobalt, copper, iron, nickel, and zinc. The SPE method was applied to the determination of analytes in standard reference material (CRM), in various tea and plant samples.

Keywords: Heavy metals, Resin, Solid phase extraction, FAAS

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ID 261

Characterization and Swelling Behaviors of Langmuir-Blodgett Thin Films Coated with N-cyclohexylmethacrylamide Monomer

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Langmuir-Blodgett (LB) thin films characterized by surface plasmon resonance (SPR), quartz crystal microbalance (QCM). The fitted SPR data is utilized to be calculating the film thickness of this material and is found to be as 0.76±0.08 nm for single layer. The sensing responses of the films against VOCs such as dichloromethane, chloroform, benzene and toluene are measured by the QCM method. It is found that the NCMA film exhibits good response, reversibility, stability, fast response and recovery characteristic to VOCs. The changes in resonance frequency associated with mass changes can be attributed to the swelling behavior of thin films during vapor absorption. This swelling is due to the capturing of organic vapor molecules in the LB film structure. Fick’s law for early-time diffusion is adopted to quantify real time QCM data for the swelling processes. It is observed that diffusion coefficients, for swelling obeyed the law and could be correlated with the VOCs. The responses of NCMA films to the chosen VOCs are investigated in conditions of physical properties of the solvents and the films were obtain to be largely sensitive to dichloromethane vapor compared to other studied vapors.

Keywords: Monomer, LB Thin Film, Vapor Sensor
ID 262

Organic Vapor Sensing Properties of Nano Thin Films Coated with Copolymer

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In this study, a novel poly[Styrene (ST)-co-Glycidyl Methacrylate (GMA)] copolymer material is used to fabricate Langmuir-Blodgett (LB) thin films and investigate organic vapor sensing properties. Quartz Crystal Microbalance (QCM) system is used to investigate gas sensing performance of copolymer LB films during exposure to Volatile Organic Compounds (VOCs). The poly[Styrene (ST)-co-Glycidyl Methacrylate (GMA)] LB thin film sensor sensitivities are determined to be between 0.12 and 0.25 Hz ppm⁻¹. Detection limits of the copolymer LB thin film are found to be between 23 and 49 ppm against organic vapors. The copolymer LB thin films are more sensitive to chloroform than other vapors used in this study. The results demonstrated that the poly[Styrene (ST)-co-Glycidyl Methacrylate (GMA)] copolymer material is promising as an organic vapor sensing device at room temperature.

Keyword: Copolymer, LB Thin Film, Vapor Sensor

ID 263

Development of Nanocomposites and Glassy Materials by Mechanical Alloying

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Mechanical Alloying is an advanced powder processing technique involving repeated cold welding, fracturing, and rewelding of powder particles in a high-energy ball mill. This technique, along with the mechanochemical processing, has produced a variety of scientifically interesting and commercially useful materials. The recent trend appears to be synthesis of nanocomposites, high entropy alloys, and glassy materials (including the bulk metallic glass-type) using these techniques. Nanostructured materials with a grain size of less than about 100 nm possess interesting properties including high strength, enhanced diffusivity, improved sintering characteristics, good ductility in some cases, and novel magnetic properties. The properties of these materials can be further improved by synthesizing nanocomposites containing ceramic or other phase particles. The present lecture describes our recent research efforts in synthesizing nanocomposites. The major goal of these investigations was to determine the maximum amount of nanometric reinforcement phase that can be uniformly incorporated into the metal matrix and evaluating the microstructural and mechanical behavior of Al-Al2O3, TiAl-TiSi3, and MoSi2-Si3N4 nanocomposites. We will also discuss the synthesis of metallic glassy alloys by mechanical alloying and the interesting phenomenon of mechanical crystallization.

Keywords: Mechanical Alloying; Nanocomposites; Glassy Materials
Flux assisted casting of TiB2 nanoparticles reinforced aluminum matrix composites

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Achieving effective incorporation of ceramic based nanoparticles into liquid aluminum has always been a challenge task due to their poor wettability and large surface-to-volume ratio. This also limits the use of aluminum matrix nanocomposites in the industry for the production of engineering components with enhanced mechanical properties. The present study therefore aims at fabricating master nanocomposites by a flux assisted casting method that allows obtaining a uniform dispersion of TiB2 (20-30 nm) nanoparticles at high concentrations in pure aluminum. TiB2 reinforced aluminum matrix nanocomposites were cast at various weight percentages by dilution of such master nanocomposites into commercial aluminum alloys under ultrasonic treatment. The microstructures of cast nanocomposites were investigated by means of optical and scanning electron microscopy, and it was shown that the nanoparticles were effectively dispersed and distributed throughout the matrix. The mechanical properties of alloys were also significantly improved.

Keyword: Metal matrix nanocomposites, nanoparticles, casting

The Effect of the Different Synthesis Methods of TiO2 on Performance of Dye Sensitized Solar Cells

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Titanium dioxide which has high photocatalytic activity, high chemical and thermal stability, is a semiconductor material and widely used as photoanode material in dye sensitized solar cells (DSSCs). Properties such as band gap, morphology and particle size of TiO2 play an important role on performance of DSSCs. At the same time, synthesis methods affect powders features such as morphology and particle size etc. Therefore synthesis method directly influence performance of DSSCs. For this reason, Titania powders which have anatase form were synthesized via sol-gel, hydrothermal and microwave assisted hydrothermal methods. Obtained powders were characterized via SEM, XRD, DRS and Particle Sizer. Prepared TiO2 particles were coated on FTO substrate with spin coater and used as a photoanode in DSSC. The Co-dithizone-gallic acid complex, platinium and I-/IO3- redox couple were used as sensitizer, counter electrode and electrolyte, respectively. Linear sweep voltammetry and electrochemical impedance spectroscopy were used to investigate performance of DSSCs with an electrochemical workstation. With this study, different synthesis methods of TiO2 and how these methods affects properties of titania such as particle size, morphology and band gap are investigated.

Acknowledgements
M.Ö. acknowledges the partial support of the TUBA.

Keywords: DSSCs, dithizone, microwave-hydrothermal method, TiO2
A Comparative Study on Titania/Natural Support Composites: Photocatalytic Degradation of Organic Carboxylic Acid

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Titania were synthesized on the natural supports of clinoptilolite, and SiO₂, obtained from rice husk ash, by the hydrolysis of titanium tetraisopropoxide. Titania/natural support composites were used as photocatalysts in the degradation of aqueous solution of terephthalic acid, an organic carboxylic acid, under UVC illumination. The effects of the type of the natural supports and the size of the clinoptilolite (< 38 µm and > 75 µm) on the structural properties and photocatalytic performances of the composites were investigated. The properties and performances of the composites were compared with those of the bare titania, clinoptilolite and SiO₂. The XRD spectra of the composites indicated the formation of rutile titania on the supports due to the acidic solution of titanium tetraisopropoxide. The SEM images showed the spherical and sponge like titania agglomerates on the clinoptilolite and SiO₂, respectively. The low and high surface area of the clinoptilolite and SiO₂, respectively, resulted in total and partial coverage of titania on their surfaces. Both titania and its composites exhibited higher photocatalytic activity than that of commercial titania. The composites simplified the recovery of the photocatalysts from the treated solution by increasing their rate of precipitation. Type of presentation: Oral Presentation
Keyword: TiO₂, SiO₂, Clinoptilolite, Photocatalyst, Carboxylic Acid, UV

Paper Scaffolds For Studying Bone Mineralization In Vitro

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Laboratory grade paper (Whatman) has recently been used for various purposes from production of three dimensional scaffolds to biosensors and high throughput analysis devices. Since it is a cheap, conventionally available and easily accessible material and three dimensional shapes can be formed by simply folding the paper, it has an enormous potential to study cellular behavior especially for bone tissue engineering applications. Whatman paper does not contain any binders or additives and is composed of only cellulose fibers. Cellulose is biocompatible but since it cannot be degraded by humans it is not biodegradable. Whatman paper is produced with varying pore sizes and thickness, so it provides a good attachment surface for the cells. In this research, several layers of Grade 1 (average pore size of 11 µm, 180 µm thickness) and grade 114 (average pore size of 25 µm, 190 µm thickness) Whatman papers were seeded with stem cells that have osteogenic capacity and normal bone fibroblasts, and these layers were placed on top of each other at different time points in osteogenic medium to determine the biomineralization characteristics of the cells.
Keywords: Whatman paper, mineralization, bone, tissue engineering
Zinc stannate has been synthesized by various methods such as solid-state reaction based mixed oxide, chemical precipitation, spray pyrolysis, sol-gel and hydrothermal method. Among these methods, the mixed oxide method provides an effective way to prepare well-crystallized and monophase Zn2SnO4 particles from starting oxides. However, role of the particle size of initial starting oxides on the formation of the Zn2SnO4 spinel and roles of the oxides on the spinel phase development in the mixture of ZnO and SnO2 are still need to be understood better so that Zn2SnO4 materials with improved thermal, chemical and mechanical properties can be produced in more controlled manner. Therefore, the research objective of this study was to examine the effect of the particle size, sintering temperature and time on the Zn2SnO4 spinel formation and sintering behaviour of these particles. Two different ZnO and SnO2 powders which have different particle size and surface area were used as raw materials. Four stoichiometric mixtures of ZnO and SnO2 were prepared according to their initial particle size. After sintering at different temperatures (900-1200oC) and times (1-4h), Zn2SnO4 spinel formation rates were calculated from their XRD patterns and linear changes in dimensions of the sintered samples were monitored.

**Keywords:** Zinc stannate, mixed oxide synthesis, spinel formation

Zinc stannate is an n-type oxide semiconductor that has unique properties, including high electron mobility, high electrical conductivity, and excellent optical properties. However, chemical stability of Zn2SnO4 materials in aqueous environment has not yet been reported on in detail. Therefore, the aim of this research was to investigate the effect of the pH on the chemical stability of Zn2SnO4 in aqueous media and to determine the interaction between the material and the medium. Hydrothermal synthesis is one of the most useful synthesis methods for producing homogenous powders with high purity and a controlled particle size and morphology. Accordingly, Zn2SnO4 powders were synthesized from the Zn(NO3)2.6H2O and SnCl4.5H2O at pH 9 by hydrothermal synthesis at 220 oC for 24 h under autogenous pressure. After the hydrothermal reaction, Zn2SnO4 suspensions in aqueous environment were prepared at pH 3 and pH 9 by adding HCl acid and NaOH base solutions to the distilled water, respectively. Supernatants of the suspensions were collected for the following 30 days in 24 h intervals. Ion concentrations were determined by ICP-OES. The results showed that, the dissolution of Zn2SnO4 with higher ion concentrations (>80 mg/L) at pH 3 was more significant than in pH 7 and 9.

**Keywords:** Zinc stannate, chemical stability, dissolution
ID 272

Dry Sand/Rubber Wheel Abrasion Test of Hardfacing Coatings Produced with the Addition of FeB and FeCr Powders

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Wear causes significant material, energy and time losses in industry. This study was focused on the effect of using a mixture of FeB + FeCr powders in addition to Fe-Cr-C based flux cored wire on wear characteristics of hardfacing coatings. The contribution of FeB and FeCr was changed and three different powder mixtures were composed. Microstructure, XRD and SEM-EDX analyses were executed. Borides were obtained in the sample which has the maximum FeB powder reinforcement in the powder mixture. The results of dry sand/rubber wheel abrasion test revealed that increasing boron content enhanced the abrasive wear resistance.

Keyword: Hardfacing, Boride, Carbide, Wear

ID 273

The Improved Oil Removal Using Polysulfone Membranes Containing Al2O3 Nanoparticles

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Oil intensive industries produce environmentally problematic wastewaters and their treatment is more difficult because of their high stability in aqueous solutions. Although conventional separation methods are used for the removal of oil compounds, these processes cannot satisfy environmental regulations. Therefore membrane separation processes such as microfiltration (MF) and ultrafiltration (UF) have gained attention to separate micron sized oily compounds. Many researchers have studied to increase the oil removal performance of membrane filtration by incorporating nanoparticles to the membrane matrix. In this study, the flat-sheet PSF/PEI/Al2O3 nanocomposite membranes were prepared by a phase inversion method for oil removal. 20 nm Al2O3 nanoparticles was added to the membrane matrix with a weight percentage of 0.2 wt%, 1 wt% and 5 wt%. The effect of Al2O3 nanoparticles were investigated on the structural properties and filtration performance of the membranes. Prepared membranes were characterized in terms of contact angle, water flux, porosity, ATR-FTIR, porosity and tensile strength. The oil removal performances of the membranes were evaluated with 1,800 mg/L concentration of laboratory made oil-in-water (o/w) emulsion. The highest oil removal was obtained by membrane which is blending of 15 wt% PSF, 1 wt% PEI and 0.2%wt Al2O3 nanoparticles with an oil rejection of 98.5%.

Keywords: nanocomposite membranes, oil removal, Al2O3 Nanoparticles
ID 274

The Effect of Microstructure on Abrasive Wear Resistance of Hardfacing Deposits
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Present study was aimed to investigate the effect of microstructural changes on the wear resistance of hardfacing coatings produced by arc welding using B-based and Cr-based flux cored wires. In addition to flux cored wires, both coatings were reinforced with 40 wt. % FeB + 60 wt. % FeCr powder mixture. Microstructural investigations were carried out by optical microscope. Hardness of coatings were measured using Vickers indenter under 20 kgf. Dry sand/rubber wheel abrasion test was applied and wear resistance was determined according to weight loss. Wear loss was found less when the B-based flux cored wire was used due to the size and shape of eutectic carbides.

Keywords: Hardfacing, microstructure, abrasive wear

ID 275

Surface Modification Of Commercial Ro Membranes For Forward Osmosis Applications
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Forward osmosis can be implicated in many fields such as power generation, desalination and water purification. Although the flat-sheet membranes fabricated commercially for RO purposes used for FO processes, there is a more stringent requirement of excellent seperation performance and structural properties. Zwitterionic materials are as a new generation modification materilas with both negative and positive charged units and can provide more hydrophilicity. The objective of this study is the incorporation of functional amino acid 3-(3,4-dihydroxyphenyl)-lalanine (L-DOPA) onto commercial reverse osmosis (RO) membranes (SW30 and BW30, Dow Filmtech, USA) to create a zwitterionic surface. Effects of three different surface coating methods (cross-flow, embedded, surface) were studied on membrane properties. The presence of L-DOPA layer was confirmed by Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) and membranes hyrophicity measured with contact angle analysis. The hydraulic properties of membranes were investigated with dead-end filtration tests. Cross-flow, embedded and surface modified of BW30 and SW30 membranes pure water fluxes were 1601, 512 and 483 L/m2h and 261, 219 and 201 L/m2h, respectively. Finally superior FO performances of cross-flow modified BW30 and SW30 membranes were evaluated drawing solutions (AL-DS) with 35 g/L and 50 g/L NaCl and DI water as feed solution. According to the results of the study, draw solution concentration and modification with L-DOPA have noticiable affect on water and salt transport performance.

Keywords: forward osmosis, L-Dopa, surface modification
Photocatalytic Performance Of The Iodine Doped Hollow And Mesoporous Hematite (Fe2O3) Structure Synthesized Via Sol-Gel Process
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Photocatalytic oxidation has been extensive regarded as a promising approach to remove hazardous materials from wastewater. The aim of this study is to increase photocatalytic activity of Fe2O3 photocatalysts for wastewater treatment. In this work, for the first time iodine doped Fe2O3 photocatalyst powders were fabricated by means of sol-gel method. Phase structures, surface morphologies, particle size, specific surface area and optical band gap of Fe2O3 photocatalysts were characterized through X-ray diffraction (XRD), field emission scanning electron microscope (FESEM), X-ray photoelectron spectroscopy (XPS), BET surface analysis, particle size analyzer and UV–vis diffuse reflectance spectrum (UV–vis DRS), respectively. The results illustrated that high crystalline, hollow and mesoporous iodine doped Fe2O3 particles formed. The iodine ions were inserted into Fe2O3 successfully based on XPS observations. The optical band gap values of the Fe2O3 photocatalysts varied between 2.104 and 1.93 eV. Photocatalytic efficiency of the Fe2O3 photocatalysts were assessed by using MB solution under UV light source. The photocatalytic activity findings exhibited that iodine doping enhanced the efficiency. The best iodine doped Fe2O3 photocatalyst for degradation of MB solution had 97.723 % photodegradation rate and 8.638 × 10–2 min–1 kinetic constant within 45 minutes.

Keyword: Hematite, Iodine, Doping, Photocatalytic Activity, MB solution.

Salinity Gradient Energy Potential of High Saline Industrial Wastewaters in Pressure Retarded Osmosis
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Pressure retarded osmosis (PRO) is a promising alternative renewable energy and an emerging membrane-based technology for recovering energy from salinity gradients. In a PRO system, water from a low salinity “feed solution” (e.g., freshwater) permeates through a membrane into a pressurized, high salinity “draw solution” (e.g., seawater); power is obtained by depressurizing a portion of the diluted seawater through a hydro turbine. While seawater is the most common type of draw solution; industrial wastewaters, which have very high saline concentrations, are alternative salinity gradient resources. Moreover, the discharge of these wastewaters is a serious environmental issue due to their variable pH, color, BOD and COD. Especially, leather industry wastewaters which have huge volume are suitable for to use as a draw solution in PRO applications because of their high concentrations of salt (Total Dissolved Solids, TDS). The TDS concentrations of leather industry wastewaters are typically in the range of 15,000-37,000 mg/L. Typical wastewater flux for a medium-scale leather industry is 17,000 m3/day. In this respect, these wastewaters have very high salinity and have a great potential to produce energy using PRO process. The aim of this study is to analyze salinity gradient energy potential using leather industry wastewaters as a draw solution in PRO process. It is assumed that the leather production plant is constructed next to the Sakarya River for fresh water requirements and the TDS value of leather industry was assumed as 37,000 mg/L. The results showed that annual electricity energy generation with PRO power plant for a leather factory next to Sakarya River was calculated as 2,803 MWh/y.

Keyword: salinity gradient energy, pressure retarded osmosis, high saline industrial wastewaters
Adsorption of Congo red from aqueous solution by a waste containing boron impurity

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In this study, an industrial waste (BW) containing boron impurity was used for the removal of Congo Red from aqueous solutions. Their physico-chemical properties, morphology, and surface chemistries were determined using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), SEM-EDX, scanning electron microscopy (SEM), and pHZPC. Batch adsorption studies were carried out. The adsorption of Congo Red was highly pH-dependent. The dye uptake was mainly governed by electrostatic attractions. Adsorption kinetic data followed the pseudo-second-order model. Several adsorption isotherm models were applied to interpret equilibrium data. The Langmuir isotherm model shows best fitting to the respective equilibrium data for the adsorption of Congo Red. The results showed that the BW could be used as an adsorbent for the removal of Congo Red from aqueous solutions. Key words: Congo Red, Adsorption, Isotherms, Waste References (1) Asim Olgun, Necip Atar, Equilibrium and kinetic adsorption study of Basic Yellow 28 and Basic Red 46 by a boron industry waste, Journal of Hazardous Materials, 161: 1, (15) 148-156, 2009. (2) Necip Atar, Asim Olgun, Removal of basic and acid dyes from aqueous solutions by a waste containing boron impurity, Desalination 249 (2009) 109–115.

Keyword: Congo Red, Adsorption, Isotherms, Waste

Sorption of acid violet 7 on magnetic- Poly(Ethylene Glycol Dimethacrylate-co-4-Vinylpyridine) spheres from aqueous solutions: Kinetic, isotherm and thermodynamic studies

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ABSTRACT Magnetic poly(ethylene glycol dimethacrylate-co-4-vinylpyridine) spheres, poly(ethylene glycol dimethacrylate[EGDMA]- 4-vinylpyridine (VP) [m-poly(EGDMA-co-4-VP)], produced by suspension polymerization and characterized, was found to be efficient solid polymer for acid violet 7 sorption. The m-poly(EGDMA-co-4-VP) spheres were prepared by copolymerizing of ethylene glycol dimethacrylate (EGDMA) with 4-vinylpyridine (4-VP). The m-poly(EGDMA-co-4-VP) spheres were characterized by N2 adsorption/desorption isotherms, electron spin resonance (ESR), X-ray diffraction (XRD), fourier transform infrared spectroscopy (FTIR) , thermal gravimetric analysis (TGA), X-Ray Photoelectron Spectrometer (XPS), Magnetic Hysteresis Measurement (VSM), elemental analysis, scanning electron microscope with Energy Dispersive X-Ray (SEM/EDX) and swelling studies. The m-poly(EGDMA-co-4-VP) spheres were used at sorbent/acid violet 7 ratios. The influence of pH, acid violet 7 initial concentration, temperature of the removal process was investigated. The maximum removal of acid violet 7 was observed at pH 3. Langmuir isotherm was found to better fit the experiment data rather than Freundlich isotherm and Dubinin-Radushkivich isotherm. The kinetics of the sorption process of acid violet 7 on the m-poly(EGDMA-co-4-VP) spheres were investigated using the pseudo first-order and pseudo-second-order models, results showed that the pseudo-second order equation model provided the best correlation with the experimental results. The thermodynamic parameters (free energy change, ΔG; enthalpy change, ΔH; and entropy change, ΔS) for the sorption have been evaluated. The SEM/EDX images of the m-poly(EGDMA-co-4-VP) spheres. KEYWORDS Magnetic polymers; Sorption isotherm, kinetic, thermodynamic; Acid violet 7 ACKNOWLEDGMENT This work was partly supported by the Research Fund of The University of Uludag Project Number: KUOP(F)-2013/29 and Project Number: OUAP(F)-2012/28.


Keyword: Magnetic polymers; Sorption isotherm, kinetic, thermodynamic; Acid violet 7
Cationic Dye Removal from Textile Waste-water by Using Magnetic Polymer Adsorbents
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Dye pollution in textile industries creates a huge problem to the environment. Cationic dyes have primary importance as a threat to the environment since they have mutagenic and carcinogenic effect to every living creature. Therefore, widely used cationic dyes should be removed from industrial wastes. Various methods have been used to remove these waste-water. These methods are chemical oxidation, filtration, biological treatment and adsorption. Among these, adsorption is the most widely used method since it has high efficiency, low cost, good quality and harmful substance production. The quality of adsorption technique is related to the chemical structure of adsorbent. With respect to that, chemists have to focus on the affinity of adsorbent to dye structure. The aim of this study was to identify a structure which has high affinity to a cationic dye, basic blue 41 (BB41).

In this present study, adsorption technique was applied in order to treat the aqueous systems with a new type of adsorbent with the aim of investigating the utility by doing isothermal research of the adsorption process.

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Keywords: Magnetic polymers; Sorption isotherm; basic blue 41

Application of Sepiolite-Poly(vinylimidazole) composite for the removal of Cu(II) from aqueous solution: Isotherm and thermodynamics studies
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For removal of Cu(II) ions from aqueous solution, a novel composite was prepared from 1-vinyl imidazole and sepiolite by the technique of in-situ polymerization. Adsorption of Cu(II) ions from aqueous solution onto Sepiolite-Poly(vinylimidazole) composite has been studied at 277, 298, 318, and 338 K and the experimental data were analyzed using fourteen isotherm models. The determination coefficients (R2) were determined for each isotherm analysis. The determination coefficients demonstrated that in general the accuracy of models to fit experimental data improves with the number of parameters. The Langmuir model provided the best fit to the experimental data among the two-parameter isotherms. The Toth model provided the best fit to the data among the three-parameter models. Adsorption isotherm modeling shows that the interaction of Cu(II) with Sepiolite-Poly(vinylimidazole) composite surface is localized to monolayer sorption and adsorption is an endothermic process. Additionally, adsorption experiments showed that Sepiolite-Poly(vinylimidazole) composite can be used as an effective adsorbent for the removal of Cu(II) ions from aqueous solution. KEYWORDS Clay, composite, heavy metal, isotherms, non-linear methods


Keyword: Clay, composite, heavy metal, isotherms, non-linear methods
As a class of advanced crystalline porous materials, metal organic frameworks (MOFs) have been considered to be the most promising candidates to replace the conventional porous materials in separation, gas adsorption storage, catalysis, and pollutant removal due to their diverse structure and compositions, high surface area, tunable pore size, numerous active metal sites and so on. MOFs have been increasingly employed recently in different applications. Traditional separation techniques using aqueous solution or porous solid materials such as metal oxides, activated carbons, and membranes have many problems in industrial applications. Crystalline MOFs are constructed by organic ligands and metal clusters linked with coordination bonds. Moreover, the ligands play an important role in creating symmetrical pore sizes resulting in a higher adsorption capacity. Zirconium oxide (ZrO2) has stable properties and the nature of zirconium atom connection with oxygen makes it attractive in the synthesis of MOFs to get several Zr-based MOFs. Zr-MOF (UIO-66) is thermally (up to 500°C), mechanically, hydrolytically, and chemically stable in a variety of organic solvents as well as acidic and basic aqueous media. In this study, we investigated that the synthesis of Zr-MOF nanocrystals by using different imidazolate structures as organic ligands with or without an acid modulator. Zr-imidazolates (Zr-Mim and Zr-Bim) were synthesized with two kinds of imidazolate compounds (2-methylimidazole and benzimidazole) by using solvothermal method. Polyimide (PI, Matrimid®5218) was used as a polymer matrix in MMMs. Matrimid®5218 is a prominent aromatic polyimide, which has been also investigated as a polymer matrix with various inorganic fillers such as zeolites and MOFs to fabricate mixed matrix membranes (MMMs). Zr-Mim and Zr-Bim were incorporated into polymer matrix in order to prepare PI/Zr-Mim and PI/Zr-Bim mixed matrix membranes for further using gas separation. All membranes were formed by the solution-casting method from polymer solutions which prepared with dichloromethane as the solvent. Polyimide/Zr-imidazolate nanocomposite membranes were prepared with different amount of Zr-imidazolates (0-30 w.%). The membrane morphologies were observed by the scanning electron microscopy (SEM).The physicochemical properties of the materials were characterized by XRD, SEM, TGA, FTIR, BET and N2 adsorption to understand its crystalline structure, morphology, thermal stability, and porous structure. The characterization results showed that the use of acid modulators was successful in the modulated synthesis of Zr-Mim. The synthesized Zr-Mim products were reproducibly made with a high yield plus also a relatively higher crystallinity but Zr-Bim was not observed the porous and crystalline structure. Larger crystals sizes of Zr-Mim could be obtained by using acid modulator. The resultant Zr-Mim also had high thermal stability, and comparable specific surface area.

Keyword: Zr-imidazolate, polyimide, nanocomposite, gas adsorption
Selenium Removal with Pumice Supported Nanoscale Zero-Valent Iron
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Selenium, is a nutritionally important element for the vital activities of humans and other living organisms. However, higher selenium concentrations above the maximum allowable selenium level of drinking water results in serious health effects. The maximum selenium concentration of drinking water in U.S.A. and Turkish legislation are 5 and 10 ppb, respectively. In this study, nanoscale zero-valent iron (nZVI) was coated on pumice surface. Pumice and pumice supported nZVI (P-nZVI) were used for the removal of selenium from model and drinking water sources. Sodium selenite was used for a selenium precursor. Batch removal tests were conducted at 500 and 3000 ppb selenium concentrations with different adsorbent doses (0, 100, 250, 500, 750, 1000, 1500, 2000 and 3000 mg/L). According to the results of the adsorption tests, the raw pumice was ineffective in removing selenium at all adsorbent doses and initial selenium concentrations. However, the obtained selenium removal at initial concentration of 500 ppb was about 57-61% by using P-nZVI. As expected, selenium removal of P-nZVI was decreased with increasing of selenium concentration. The removals of P-nZVI at 3000 ppb selenium concentration were decreased to 40%. It was revealed that the coating of pumice with nZVI is an emerging treatment approach for the removal of selenium. The coating procedure need to be revised to obtain higher removal rates.

Keyword: Drinking water, nZVI, Pumice, Selenium

Adsorption Of Carbon Dioxide On Mil53(Al), Cubtc And K-Nax Zeolite
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CO2 adsorption on K exchanged NaX zeolites, and metal organic frameworks (MOFs), namely Cu-BTC and MIL53 (Al) was studied at 5 °C and 25 °C. Exchange via ultrasonic and traditional methods, was conducted at 50°C and 70°C. The maximum replacement of Na+ ion with K+ ion in the extra framework of zeolite was increased from 76 % to 83% with increasing temperature from 50°C to 70°C in the ultrasonic method which is more effective than traditional one. Compared with the zeolites, the MOF adsorbents used in this work have higher Langmuir specific surface area values namely 1278, 1473 and about 1000 m2/g m2/g for MIL 53, Cu-BTC and zeolite adsorbents respectively. The resulting CO2 isotherms can be well represented by the Toth equation. Comparison of the isosteric heat of adsorption at zero loading shows that CO2 was adsorbed more weakly on MOFs than zeolites.

Keywords: CO2, adsorption, Ultrasound, NaX zeolite, MOF
The present study examined the effect of ultrasonic probe on ion exchange kinetics to obtain Ce-rich X zeolite and its structure. The results were compared to those obtained from traditional batch exchange method and ultrasonic bath under similar conditions. Contact time, initial cation concentration (fold equivalent excess) and the types of the ultrasound were studied. Ultrasonic probe enhanced the replacement of Na+ ion with Ce3+ ion in the extra-framework of zeolite up to 73% by applying five consecutive ion exchanges. As compared to the traditional exchange method and the ultrasonic bath, the ultrasonic probe applied was found to be very effective on the exchange amount at equilibrium. The ion exchange experiment by ultrasound did not cause the amorphization of ion exchanged zeolite but resulted in decrease in the peak intensity as observed by XRD. The specific surface area of ion exchanged zeolite decreased when the monovalent sodium ions were exchanged with trivalent cerium ions especially by using ultrasonic probe due to decreasing the number of Na+ ions present in the supercage.

Keywords: NaX zeolite; Ultrasound; Ion exchange; Characterization

Dry reforming of methane over mesoporous SBA-15 supported bimetallic Ni-Co catalysts

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Dry reforming of methane is an attractive route for the conversion of biogas into syngas, which may then be used for the synthesis of valuable chemicals and non-petroleum fuels. In this study, activity of mesoporous SBA-15 supported bimetallic nickel and cobalt catalysts were investigated in dry reforming of methane reaction. The catalysts were characterized by XRD, N2 adsorption-desorption, SEM, TEM and TG/DT techniques before and/or after activity tests. N2 adsorption-desorption isotherm of the catalysts were consistent with Type IV isotherm, indicating formation of mesoporous structures. TEM images of bimetallic catalysts clearly proved the presence of characteristic honeycomb structure. In the XRD pattern of the catalysts, a Ni-Co alloy formation was observed. Dry reforming reactions were performed at 750°C in a fixed bed flow reactor at a time space of 0.1 s.g.cm-3. Activity test results showed that bimetallic Ni-Co catalysts gave highly promising results with a methane and carbon dioxide conversion of 73% and 89%, respectively. TG/DT analysis showed that almost no coke (<3%) was formed over spent bimetallic Ni-Co catalysts after 4-h activity tests. SEM images and XRD patterns of the spent catalysts were consistent with TGA/DT results. 

Acknowledgement: Gazi University Research Fund (BAP-06/2016-12) grant is gratefully acknowledged.

Keyword: Dry reforming, Hydrogen, SBA-15, Bimetallic catalyst, Nickel-Cobalt
Solar energy is the clean, green and plentiful renewable energy sources [1]. Gratzel et al. in 1991 developed dye sensitized solar cell (DSSC), these have interested in many researcher’s due to their low cost and envorimental friendly applications [2]. Condensed tannins are composed of oligomeric or polymeric various flavonoid units. Mimosa and quebracho tannins are rich in condensed tannins and their derivatives like catechin and epicatechin [3]. We have synthesis TiO2 nanostructures by microwave-hydrothermal synthesis method. The TiO2 was deposited on glass substrates by the doctor-blade technique. The mimosa or quebracho tannin-Fe complex dye; 0.01M FeCl3 9H2O and 0.01M mimosa or quebracho tannin (1:1) were mixed and stirring magnetic stirrer for 20 minutes. The resulting films were immersed in 0.01M solution of mimosa or quebracho tannin-Fe dye in acetonitrile for 24 h. The electrolyte consists of 0.1M LiI, 0.05M I2, 0.05M 4-tert-butylpyridine in dissolved acetonitrile was used as the electrolyte solution. A counter electrode was prepared by spreading a droplet of 5 mM of H2PtCl6·6H2O in 2-propanol. The characterization of TiO2 was carried out by XRD, FE-SEM and EDS. The current densities versus voltage (J−V) characteristics of the cells were measured using a solar simulator (Oriel) and CHI 660C electrochemical workstation. Acknowledgements M.Ö. acknowledges the partial support of the TUBA. References [1] Agarkar, S.A., Kulkarni, R.R., Dhas, V.V., Chinchansure A.A., Hazra, P., Joshi S.P., Ogale, S.B., ACS Appl. Mater. Interfaces, 2011, 3, 2440-2444. [2] O'Regan, B., Grätzel, M., Nature, 1991, 353, 737−740. [3] Çakar, S., Güy, N., Özacar, M., Fındık, F., Electrochim. Acta, 2016, 209, 407–422.

Keyword: Dye sensitized solar cell, condensed tannin, Fe-condensed tannin, TiO2

Graded porous ceramics have been applied in a wide range application from biomaterial to electronic devices. In this study, graded porous Si3N4 ceramics were produced by several shaping processes using various amounts of PVC as pore former additive. A burn-out step was applied at 750°C at air atmosphere and sintering was carried out at 1700°C for 1-3 hours under nitrogen atmosphere. The effect of lamination sequence and sintering time on the final properties of the ceramics were investigated. The relative density of samples was between 32 to 42% and open porosity values were in the range of 57-66%. It can be concluded that it was possible to produce graded porous Si3N4 ceramics by using several shaping techniques.

Keyword: graded porosity, silicon nitride, characterization
Chitosan, a linear, biodegradable and biocompatible, polysaccharide-based polymer and the major derivative of chitin, is a very abundant biopolymer in nature. Due to its many desirable properties like biocompatibility, biodegradability, hemostasis features and antibacterial activity against various types of bacteria, chitosan has gained increased interest in various fields [1, 2]. Chitosan has been especially employed in biomedical applications such as drug delivery and tissue engineering [3]. It also has applications in agriculture and water purification. In many applications, chitosan needs chemical modification especially to increase its solubility in water or organic solvents. This study focuses on the N-phthaloylation and PEGylation of chitosan, as a chemical modification tool to impart water solubility and enhanced bioavailability.

References:

Keywords: Chitosan, chemical modification, PEGylation

The crystallization of hydroxyapatite (HAP) was carried out in a batch type crystallizer through the reaction of calcium dichloride solution with potassium dihydrogen phosphate solution in the absence and the presence of valeric acid as additive. The influence of valeric acid concentration ranging between 100 and 1000 ppm on HAP crystallization was investigated. The crystals obtained in pure media and the presence of additive were characterized using BET analysis, scanning electron microscopy (SEM), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR). Furthermore, TG-DTA analyses were applied on the crystals produced to investigate the thermal degradation. The obtained thermal data were utilized to calculate the activation energy using Kissinger method. The evaluated activation energy showed that valeric acid adsorbed on crystal surface and it had significant effects on the crystal morphology and thermal decomposition behaviour.

Keywords: Hydroxyapatite, valeric acid, Kissinger kinetic model
The Characterization And Polymorphism Of A Glycine In The Presence Of Butyric Acid

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The phase transformation of β glycine to α glycine was explored in pure media and the presence of butyric acid used as an additive in this study. The experiments were performed at various butyric acid concentrations (100 ppm, 500 ppm and 1000 ppm) to investigate the effects of additive and its concentration of phase transformation. The transformation process was followed by continuously measuring the ultrasonic velocity in the crystallizer. The average particle size of the α glycine crystals was measured and the filtration characteristics of the crystals were evaluated as a function of additive concentration. Besides, XRD and SEM analyses were applied to determine the crystal structure and morphological changes respectively. To further understand the effects of butyric acid on α glycine crystals, the growth rate of the crystals obtained in pure media and in the presence of additive were calculated using crystallization kinetic models. When the characterization and the kinetic analysis results were assessed together, it was determined that butyric acid bound onto the crystal surface and it led to a change in the growth rate of the α glycine.

Keyword: Glycine, polymorphism, butyric acid, crystallization kinetic models

Investigation of Mechanical Properties of Mmcs From Direct Recycled Powders

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Aluminum has a wide range of applications due to its superior corrosion resistance, thermal and electrical properties, easy processability and light weight. Thanks to the recyclability of this metal many times, it is provided high energy saving in its production. The recycling of aluminum from scrap has become an important component of today's aluminum industry. In this study, 7075 aluminum alloy powders produced by disc mill from metal scrap chips and mechanical properties of P/M and reinforced %10 SiC composites produced by direct recycling method from these powders are investigated. Milling parameters are 1000, 1200, 1400 rpm milling speeds and 10 min milling time. Density, hardness and rupture strength of composites was determined. With SEM analysis, influence of microstructure on mechanical properties was investigated.

Keywords: Direct recycling method, scrap chips, 7075 aluminum alloys
ID 301

Synthesis and Structural Characterization of 2D and 3D→3D Interpenetrated Coordination Polymers with Cu(Ii)-3,3-Dimethylglutarate

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In the past two decades, coordination polymers (CPs) with interesting structural topologies and potential applications such as sorption, gas storage/separation, magnetism, non-linear optics, sensors, luminescence and catalysis have been extensively explored in the fields of crystal engineering. In this study, [Cu2(μ4-dmg)2(μ-pbix)]n (1) and [{Cu(μ-dmg)(μ-pbix)}2H2O]n (2) complexes are synthesized with hydrothermal method by using 3,3-dimethylglutaric acid (H2dmg) and 1,4-bis((1H-imidazol-1-yl)methyl)benzene (pbix). The structures of the complexes have been characterized by elemental analysis, spectroscopic (IR), thermal analysis methods (TG/DTA) and X-ray single-crystal studies. According to X-ray diffraction analysis result, the asymmetric unit of 1 consists of one Cu(II) ion, one dmg ligand and half pbix ligand. Two Cu(II) ions are bridged by carboxylate oxygen atoms offour dmg ligands to form paddlewheel [Cu2(CO2)4] units forming a 1D double-chain structure. The adjacent 1D chains are connected to each other by the pbix ligand to further extend a two-dimensional (2D) coordination polymer. The asymmetric unit of 2 consists of a half Cu(II) ion, a half dmg ligand, a half pbix ligand and one non-coordinated water molecule. Dianionic dmg and neutral pbix ligands coordinate to Cu(II) ions to form a three-dimensional (3D+3D=3D) interpenetrated coordination polymer. Furthermore, topological and thermal properties of complexes were studied.

Keywords: Coordination polymer; 3,3-dimethylglutarate complex; Copper(II) complex

ID 302

3D→3D Interpenetrated Coordination Polymer Constructed From Thiophene-2,5-Dicarboxylate And 1,4-Bis[(2-Methylimidazol-1-Yl)Methyl]Benzene Linkers

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Over the last two decades, coordination polymers (CPs) have been identified as promising materials for a variety of applications such as gas storage and separation, sensing, catalysis and drug delivery due to their permanent micro-porosities, high internal surface areas and adjustable structures. In this study, a mixed-ligand Zn(II) three-dimensional coordination polymer, namely [Zn2(μ4-tdc)(μ-pbmeix)0.5]n (1), has been synthesized under hydrothermal conditions with thiophene-2,5-dicarboxylic acid (H2tdc) and 1,4-bis[(2-methylimidazol-1-yl)methyl]benzene (pbmeix) ligands. The structure of complex 1 has been determined by single crystal X-ray diffraction analyses and further characterized by elemental analyses, IR spectra, and thermal analyses (TG, DTA) and powder X-ray diffraction (PXRD). The asymmetric unit of 1 contains one Zn(II) ion, one tdc and a half of pbmeix ligands. Two Zn(II) ions are bridged by carboxylate oxygen atoms of four tdc ligands to form paddlewheel [Zn2(CO2)4] units forming a 2D network. The adjacent 2D layers are connected to each other by the pbmeix ligand to further extend a 3D framework. The most striking structural feature of 1 is that it possesses a 2-fold interpenetrating 3D+3D→3D architecture. The TG/DTA curve of complex shows that the complex is stable up to 306 °C. Furthermore, topological and luminescence properties of complex were studied.

Keywords: Interpenetrated Coordination polymer; thiophene-2,5-dicarboxylate complex; Zinc(II) complex
Construction of 1D and 2D Coordination Polymers with Co(II)-3,3-Dimethylglutarate And Flexible Bis(Imidazole) Ligands
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In the recent years, coordination polymers (CPs) with entangled architectures have gained a great deal of attention not only due to their potential applications in fields such as gas adsorption and separation but also due to their diverse structural topologies. To design and synthesize CPs with the desired structure and specified properties, many structural and experimental factors play important roles in the self-assembly process of CPs. In this study, we selected flexible bis(imidazole) bridging ligands which are 1,2-bis((1H-imidazol-1-yl)methyl)benzene (obix), 1,3-bis((1H-imidazol-1-yl)methyl)benzene (mbix) and new coordination polymers with 3,3-dimethylglutaric acid (H2dmg), namely [Co6(μ4-dmg)2(μ-dmg)4(µ-obix)4(H2O)4]·3H2O (1) and [Co(μ-dmg)(µ-mbix)]n (2) were synthesized and characterized by elemental analysis, IR spectra and single crystal X-ray diffraction. According to X-ray diffraction analysis result, complex 1 crystallizes in a monoclinic system with space group C2/c. Trinuclear cobalt units are bridged by dianionic dmg and neutral obix ligands to form 1D coordination polymer. Complex 2 crystallizes in a monoclinic system with space group P21/c. Co(II) ions are bridged by carboxylate oxygen atoms of dmg ligands to form 1D chain structure. The adjacent 1D chains are connected to each other by the mbix ligand to further extend a 2D coordination polymer. Furthermore, topological and thermal properties of complexes were studied.

Keywords: Coordination polymer; 3,3-dimethylglutarate complex; Cobalt(II) complex

Structural Characterization of 3D+3D→3D Interpenetrated Coordination Polymer with Zn(II)-Thiophene-2,5-Dicarboxylate And 1,4-Bis(2-Isopropylimidazol-1-Yl)Butane
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Porous Coordination Polymers (PCP) are used in applications such as gas storage, molecular sensors, drug delivery platform or catalyst support material because they have a very high surface area. Heterocyclic dicarboxylic acids which can be used as a ligand coordinate the metal ions as bridging ligand at the synthesis of coordination polymers. Especially, thiophene-2,5-dicarboxylate (tdc) which can bridge metal ions by oxygen atoms of carboxylate groups is a functional ligand. In this study, [Zn2(µ4-tdc)2(µ-bisopib)]n (1) is synthesized with hydrothermal method by using tdc and imidazole derivative of 1,4-bis(2-isopropylimidazol-1-yl)butane (bisopib). The structure of the complex has been characterized by elemental analysis, IR spectra and single crystal X-ray diffraction. Single crystal X-ray analysis reveals that complex crystallizes in the orthorhombic space group Pbcn. The asymmetric unit consists of two Zn(II) ions, two tdc and two half bisopib ligands. The two Zn(II) ions are bridged by four carboxylate groups from four different tdc ligand, forming a paddle-wheel SBU. Adjacent 2D [Zn2(tdc)2]n layers are pillared by µ-bisopib bridging linkers to form the 3D framework. Interestingly, the final structure of complex occurs interpenetration of two chiral single frameworks, leading to 2-fold hetero-interpenetrating 3D+3D frameworks. Furthermore, topological and luminescence properties of complex were studied.

Keywords: Hetero-interpenetrated coordination polymer; thiophene-2,5-dicarboxylate complex; Zinc(II) complex
ID 305

Study on Waste-to-Energy incineration potential of municipal solid waste in İzmir province accoding to R1 criterion

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Nowadays, energy demand and dependence on energy have been steadily increasing with the growth of World population and development of technology. One way to develop an alternative energy source as a renewable energy source is to use the energy that the municipal solid wastes (MSW) contain. MSW are considered as renewable and sustainable energy source due to fact that they contain large fraction renewable material with energy content and are continuously produced as the result of human activity. Incineration, defined as the controlled burning of waste at high temperatures, eliminates pathogens, reduces the volume of waste and recovers energy from waste. This is because the Waste-to-Energy (WTE) incineration is accepted as a favorable alternative to cope with waste generation problem and a potential renewable energy source. The effort of reduction of the landfill based on the Directive introduced by European Union has popularized incineration plants in Europe. The EU Waste Directive (Directive 2008/98/EC) that came into force in 2008 determines basic ways of the waste handling. This directive also covers when the incineration of municipal solid waste is energy-efficient and when it may be considered a recovery operation. The criterion called R1 is defined with the aim of differentiating waste operation by incineration as either disposal or energy recovery of MSW based on threshold values of 0.60 and 0.65. The values above these limits the plant is considered an energy recovery plant. In this study, the incineration potential of the MSW of İzmir which is third biggest city of Turkey is evaluated in consideration of R1 criteria. The energy recovery (heat and electricity) potentials based on R1 criteria of MSW were investigated taking into account the amount, composition and calorific value of MSW. The estimates of energy recovery from MSW of İzmir were conducted based on future population and waste projections.

Keywords: Waste-to-Energy, Incineration, Municipal Solid Waste, Energy recovery

ID 306

Numerical investigation of heat transfer from a moving isothermal hot plate due to triplet impinging jets

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Heat transfer performance due to triplet jets impingement onto a moving isothermal hot plate were numerically investigated in this study. Numerical modeling were carried out for two dimensional laminar flow. The rectangular flow geometry consist of a confining adiabatic wall placed parallel to the moving impingement plate. The vertically downward directed jet slots located symmetrically at the middle of adiabatic top wall. Al2O3 nanoparticles-water, Cu nanoparticles-water and CuO nanoparticles-water nanofluids with different volumetric fraction were used as working medium. The principal aim of this study is to investigate the effect of the jet exit Reynolds numbers in the range of 50 ≤ Re ≤ 200, the normalized plate velocity ranging from 0 to 2, volumetric fractions of the nanofluids. Also, the effects of using different nanofluids as a working medium on heat transfer performance were investigated. The computed flow patterns and isotherms for various combination of these parameters are analysed to understand the effect of normalized velocity of isothermal hot plate and Reynolds numbers on heat transfer. The variation of local Nusselt number at hot moving plate for these combinations of the flow parameters are presented.

Keyword: Nanofluid, CFD, Jet impingement, Moving isothermal plate, Heat transfer
ID 307

**Pectin-Zeolite Based Wound Dressing Materials for Chronic Inflammatory Skin Diseases**
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Chronic inflammatory skin diseases are group of autoimmune-disorder diseases that have no total cure yet. Because of the crucial role of carbohydrate–protein interactions in human-biology, they are of great interest for wound healing applications. Pectin, a natural polysaccharide, imparts many advantages for wound-dressings such as egg-box shell property, binding bioactive molecules, having anti-inflammatory/antibacterial/antimicrobial effects. We demonstrated here; preparation and characterization of pectin-zeolite based controlled drug-delivery systems with model drug-(theophylline) or protein-(Bovine Serum Albumin) as a wound dressing, with different synthesis methods leading to two different diffusion mechanisms: diffusion into membrane and into matrix. The relations among design parameters such as the preparation method, plasticizer type, pH, zeolite-(Na+ Zn2+) form and component amounts were investigated. We visited thermodynamic theories to shed light into the drug release mechanism. The structure-properties relationship will permit a focus on the synthesis of an effective controlled-delivery system. When the drug and zeolite were added together into the biofilms, film structures were changed drastically in SEM images. Our synthesis method leading to diffusion into matrix mechanism resulted into more controlled-drug delivery composites. Na+-zeolite composites had much higher swelling ratios and release as compared to Zn2+-zeolite films, except one critical formulation leading to a more controlled drug-delivery.

**Keyword:** Drug delivery systems, hydrogel, pectin, wound dressing, zeolite

ID 308

**Numerical modeling of pressure drop and heat transfer in open-cell metal foam**
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Metal foams are attractive for heat transfer applications because of their large surface area to volume ratio and complex structure that promotes mixing. In this study, microstructure of metal foam is modeled in three dimensions based on a sphere-centered-cube periodic unit cell. The model is for 20 ppi open cell metal foam. Pressure drop and heat transfer are investigated for this structure numerically by using COMSOL Multiphysics software. A wide range of inlet flow velocity is studied (from pre Darcy regime to turbulent). The results of numerical calculations for pressure drop and heat transfer in metal foam are represented and compared to experimental data for 20 ppi open cell metal foam. The results are in a good agreement with experimental data.

**Keyword:** Porous media, Metal foam, Heat transfer, Pressure drop
Synthesis of Termosensitive Cellulose Nanofibers

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Cellulose derivatives are used for coatings, laminates, optical films, pharmaceuticals, foods, and textiles. It is produced in a sustainable way and offers many possible uses such as textile, paper and cardboard because of its renewability and biodegradability. Biopolymers such as cellulose, chitosan and collagen from renewable resources have become increasingly important in the development of smart materials. In order to expand the applications of biobased composite materials, it is imperative that the issues related to their thermal stability be addressed. While it is possible to influence the thermal stability of lignocellulosic fibers with chemical modification, such as acetylation (Glasser et al. 1999; Herdle and Griggs 1965), now scientists have made cellulose into all kinds of films, such as films for hemodialysis, water resistance and as smart materials (Electro-Active Paper, EAPap). Cellulose consists of a linear 1,4-ß-glucose linked arranged in linear chains, where every other glucose residue bears three hydroxyl groups. These OH groups provide hydrophilicity to the cellulose molecule. In this study, methylol groups formed from cellulose, react with ceric ion redox reaction yielding radicals. By the reaction of these radicals with hydrophilic monomers such as n-isopropyl acrylamide (nIPAM), sodium vinylbenzene sulphonate (SVS); and with hydrophobic vinyl monomers such as styrene, t-butyl metacrylate were polymerized with cellulose fibrils. Different ceric ion and monomer concentration are used to obtain termosensitive cellulose fibrils in this study. Light microscopy was used to analyse for thermal behavior of the modified cellulose nanofibers at different temperatures (Figure 1). SEM results were compared with unmodified cellulose. Figure 1: visual inspection (light microscopy) of unmodified and modified cellulose fibers

References

Keywords: cellulose, nanofiber, termosensitive, modified cellulose, ceric ion

Thermal properties of chicken feather/PLA biocomposites

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The use of natural fibers in bio-based polymer matrix is highly beneficial due to the favorable properties, including biocompatibility and biodegradability. In this study, bio-based composites were produced by using polylactic acid (PLA) and chicken feather fibers (CFF) at a total mass content of 2%, 5% and 10%. Fibers used as reinforcement in PLA were prepared by cutting barbs manually from rachises of CFFs. Following the sterilization process with hot water, CFF were kept in an oven at 600C for 6h for dehumidification. After the composites were manufactured by twin screw extruder for different CFF/PLA specific ratios, they were chopped into two different specific lengths (0.3 and 2 cm) in order to study the effects of fiber concentration and fiber length on thermal properties. Thermal properties of the CFF/PLA composites were examined through differential scanning calorimetry (DSC), thermogravimetric analysis (TGA) and dynamic mechanical analysis (DMA). The results obtained from tests showed that the heat flow increased with the CFF content on the glass transition, on the crystallization temperature and on the melting temperature. In case of degradation, the weight percentage increased with the increasing CFF content in composites. The storage modulus increased and the Tan δ decreased with the increasing CFF content.

Keywords: chicken feather, PLA, biocomposites, thermal characterization, discontinuous reinforcement
Low-velocity impact response of flat and curved sandwich panels with graded core

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This study is about to impact response of sandwich composites with graded core that is popular topic nowadays. The flat and curved panels having 2 different radius of curvature (100 mm and 160 mm) were investigated. The panels consisted of E-glass/epoxy face sheets and graded PVC foam cores having 3 different properties (AIREX C70.55/90/200). Sandwich composite panels were fabricated by vacuum assisted resin infusion molding (VARIM) method. Steel molds were used to manufacture the curved panels by thermoforming process. After manufacturing process, sandwich panels were cut into 100 mm and 100 mm dimensions. Thicknesses of the face sheets and core were 0.75 mm and 15 mm, respectively. Graded cores had 3 different foams with equal thickness of 5 mm. Impact tests were performed under constant impact energy of 10 J using instrumented drop-weight machine. The contact force and displacement histories of curved sandwich composites were measured to determine the impact response. The results showed that the curvature and graded foam affected the contact forces and deformations of the panels. For the sandwich panels with single type foam, it was seen that increasing of the radius of curvature and foam density increased contact forces. The panel with 200/90/55 stacking sequence and 100 mm radius of curvature exhibited the highest contact force among the panels with graded foam.

Keyword: graded panels, curvature effect, foam properties effect, impact

Utilization Of Agricultural By-Products For Activated Carbon Production And Its Use As Catalyst Support

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Agricultural by-products are abundant and cheap precursors for production of activated carbon. As catalyst support, activated carbon exhibit significant advantages due to its large specific surface area, high porosity, excellent electron conductivity, regenerability and chemical inertness. Our previous findings showed that activated carbon improved gasification performance of biomass to produce hydrogen-rich gas when it was used as catalyst support. Therefore the aim of the study was to prepare activated carbons from waste biomass and using them as catalysts support for deposition of Pt metal particles to produce highly active catalysts for gasification of glycerol by aqueous-phase reforming (APR). In the study, activated carbons were prepared from corn straw and cotton linter, utilizing two efficient and inexpensive method: 1) hydrothermal pre-carbonization of biomass at 250°C for two hours in a batch reactor 2) pre-carbonization of biomass at 400°C for four hours under N2 flow, then for both samples chemical activation with H3PO4 and complete carbonization at 700°C for two hours under N2 atmosphere in a tube furnace. According to the results, activated carbon prepared from linter by using method 2 had highest BET surface area and exhibited high activity and selectivity for hydrogen production in APR of glycerol.

Keyword: Activated carbon, biomass, catalyst, aqueous-phase reforming, glycerol
Nanocrystalline mesoporous titania powders were synthesized by two different methods: sol-gel processing and sonochemical precipitation. The study was aimed to show how porous structure of TiO2 powder is dependent on preparation method and calcination temperature. Both methods include hydrolysis of titanium (IV) isopropoxide in different media: an ethanol rich environment (Sol-Gel Processing-SG) and a water rich environment with in situ ultrasonically treatment (Sonochemical Precipitation-SP). The obtained powders were calcined at different temperatures (200, 300, 400°C) to investigate the evolution of pore structure which was determined by N2-sorption. The BET surface area of SG powders prepared by different titanium (IV) isopropoxide concentrations and calcined at 400°C showed that the pore diameter (4 nm) and surface area were almost the same as the concentration was increased (104 and 99 m²/g for powders derived from gels containing 1 and 8 wt% of TiO2, respectively). The calcination temperature has a great impact on the surface area and pore structure of SP powders. When calcination temperature increased from 200 to 400°C, the surface areas decreased from 232 to 167 m²/g and pore diameters increased from 5.4 to 8.2 nm indicating formation of interagglomerates.

**Keyword:** titania, pore, sol-gel, precipitation

Microbial Fuel Cells (MFCs) have an important role in today’s research as a clean energy sources. Microbial Fuel Cells, enable the conversion of the chemical bond energy in organic materials to electrical energy by metabolic activities of microorganisms and, ensure solutions for wastewater treatment and electricity generation. The molasses has very high Chemical Oxygen Demand(COD) and low pH values and is located between 17 wastewater polluting the environment. In the study, molasses medium was used in the anode in dual chamber MFC, the effect of neutral red(NR) and methylene blue(MB) were investigated as mediator on voltage. The bacterial community of MFC was fed with fresh molasses medium in fed-batch system and the COD value was calculated as 14 g/L. At the end of the 30-day incubation period, the voltage values were determined as 281 mV, 463 mV, 477 mV in the mediatorless molasses medium, with NR and MB sequentially. Also, the decolorization of mediator dyes were determined for NR and MB. Decolorization yield of NR and COD removal rate were determined as %86 and %50 sequentially. In addition to this the decolorization yield and COD removal of MB were determined as %86 and %80 at 28 days incubation.

**Keyword:** Microbial fuel cells, bioelectricity, molasses, neutral red, methylene blue
Congo Red Adsorption onto Polymeric Composites: Isothermal Study
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Congo red (CR) is the first synthetic dye capable of dying cotton directly which is also one of the highly water soluble and toxic secondary diazo dye which has a major importance to remove from effluents and waste-water. Although there are plenty of methods used for dye removal such as chemical precipitation, ion exchange, electro-dialysis, ultra-filtration membrane separation, photo-degradation, electrochemical oxidation, out of these techniques, adsorption is favorable. Some methods are very costly, time consuming and generate highly toxic sludge. Therefore, economical and ecofriendly process is required for the removal of dyes from contaminated water. In recent years adsorption has gathered a lot of attention and proves to be more effective technique because of its simplicity, economic viability, ease of operation and availability of wide range of adsorbents.

In this present study, with intent to enhance the separation properties of the polymer adsorbent, magnetic materials are included in the polymerization process. On the purpose of CR removal from aqueous solutions, adsorption experiments of magnetic polymer composites in aqueous CR solutions carried out and isothermal studies of the adsorption process demonstrated that the adsorbent was applicative.

Keywords: Polymer composites, dye removal, congo red

Phase formation and microstructure evolution of porous hydroxyapatite coatings on commercially pure zirconium during plasma electrolytic oxidation process
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Porous coatings that contain bioactive hydroxyapatite (HAp) and calcium-based ceramics were directly produced on the commercially pure zirconium surface by plasma electrolytic oxidation (PEO) in a single process. PEO coating process was applied at five different treatment times for a single current density. phase formation and microstructural evolution of the Ca-P based PEO coatings were investigated in this study. For this intention, the effect of various treatment times on the nature of phase formation and on Ca-P distribution was examined with the aid of XRD, ATR-FTIR and EPMA-WDS. Porous coatings were characterized by SEM, surface profilometer and eddy current method respectively. The XRD results revealed that Zr, m-ZrO2, c-ZrO2, Ca0.15Zr0.85O1.85, CaZrO3 and Ca10(PO4)6(OH)2 (HAp) phases were formed on the surface of the commercially pure zirconium. According to the XRD and ATR-FTIR results, HAp structure was transformed from amorphous to crystalline phase with increasing treatment times. EPMA-WDS mapping showed that Ca-P content was nearly homogeneous distributed on the surface of coatings, significantly improved with increasing treatment times in accordance with XRD and ATR-FTIR. However, P content of the coatings was mostly observed at the edge of the cross-section area. Surface roughness and thickness of coatings were increased with increasing treatment times.

Keyword: Bioceramic Coatings, Zirconium, Biomaterials, Hydroxyapatite, Plasma Electrolytic Oxidation (PEO).
Removal of Basic Yellow 13 Textile Dye Pollutions with Polymeric Adsorbents
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Over one hundred thousand synthetic paints are being used commercially which is estimated that approximately seven hundred thousand tons of productions are made worldwide. Moreover, it has been reported that about 10-15% of these dyes are thrown with industrial waste-water. Chemical dyes in waste-waters have a negative impact on aquatic organisms and humans. They are able to cause allergic reactions, dermatitis and even mutations and cancer. There are number of techniques used to remove dyes from waste-waters such as chemical oxidation, coagulation–flocculation, biological treatments. Adsorption is a technique that can produce a high-quality effluent of which is not including harmful substances. Moreover, adsorption is inexpensive and fast method with respect to the other techniques can be used for dye removal.

In this present work, Basic Yellow 13 (BY13) adsorption onto magnetic polymer adsorbent which is characterized by elemental analysis, VSM technique and N2 gas adsorption/desorption technique, was investigated by means of initial concentration, pH effects to an amount of adsorption and also isothermal properties of BY13 adsorption were studied. 

Keywords: Polymeric adsorbents, adsorption, cationic dye removal

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Metal–Organic Frameworks (MOFs) are porous crystalline materials composed of metal ions or metal cluster nodes connected by organic ligands. They have attracted significant research interest in recent years, not only for their extraordinarily high surface areas, tunable pore size, and adjustable internal surface properties but also for their many attractive applications in heterogeneous catalysis, gas storage, separation, biomedical, sensing, molecular recognition, water treatment and other fields [1]. Compared to atomic or bulky counterparts, nano-sized materials owe superior physical and chemical properties due to their mesoscopic effect, small object effect, quantum size effect and surface effect. Recently, Fe3O4 MNPs have been intensively investigated because of their superparamagnetism, high coercivity and low Curie temperature. In addition to these characteristics, Fe3O4 MNPs are also non-toxic and biocompatible materials. [2–4].

In this work, a new magnetic metal organic framework (MMOF) has been synthesized as a support material to increase the efficiency and reusability of palladium for use in catalysis applications. The metal nodes of MOFs are iron (Fe) and gallic acid (GA) was used as the organic linker. The Fe3O4 MNPs were synthesized by the sonic assisted assisted coprecipitation method. Once the MOF was obtained, Fe3O4 MNPs they were attached to the MOF. Obtained MOF system and MNPs were characterized by a FTIR, TGA, XRD, UV-Vis spectrophotometry. The synthesized and characterized Fe3O4@FeGA-MOF is a good alternative as a magnetically separable material for chemical application.

Acknowledgements
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REFERENCES

Keywords: Fe3O4 MNPs, Gallic acid, Metal–Organic Frameworks, Coprecipitation method.
ID 325

Catalytic Activity Of Cesium Salt Of 12-Tungstophosphoric Acid Supported On Sba-15 In The Esterification Of Acetic Acid With Butanol

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The 12-tungstophosphoric acid of cesium salt supported on SBA-15 (Cs-TPA/SBA-15) was synthesized by the two-step impregnation. A series of catalysts containing 20%, 40% and 60% of Cs-TPA on SBA-15 were synthesized. The samples were characterized by FT-IR (pridin), XRD, XRF BET, diff-UV and SEM. It were seen that Cs-TPA was hold on to SBA-15 and structure of SBA-15 was deformed at high loading percentage. The 40% Cs-TPA loaded on SBA-15 showed the highest catalytic activity among the samples prepared in this study. Therefore, the kinetics of esterification of acetic acid with butanol were studied in the presence of 40% Cs-TPA/SBA-15.

Keyword: 12-Tungstophosphoric Acid Cesium Salt, SBA-15, Characterization, Esterification

ID 326

Nickel Nanoparticle-Decorated Graphene Oxide as an Electrode Material for Electrochemical Determination of Rutin

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Rutin (3,4,5,7-tetrahydroxyflavone-3-rutinoside) as a kind of bioactive flavonoid substance which commonly found in plants has gained tremendous attention due to antioxidative activity. Rutin has been widely used in the treatment of many diseases such as inflammatory, cancer, allergy, viral infections, as well as diluting the blood and lowering blood pressure [1-2]. Hence, it is of great important to develop a simple, fast, cheap, environmentally-friend method for rutin determination in pharmaceuticals, foods and clinic samples. In this paper, Ni-NIO particles were incorporated on the graphene oxide (GO)-glassy carbon electrode (GCE) surface by electrochemically and donated as Ni-GO/GCE. The composite electrodes surface morphology and chemistry were identified by scanning electron microscopy, electrochemical impedance spectroscopy and X-Ray photoelectron spectroscopy techniques. Under optimized conditions, the calibration graph is linear between 1.1x10-8-1.5x10-5 mol L-1 with a detection limit of 3.2x10−9 mol L−1 for rutin on Ni-GO/GCE. The proposed Ni-GO/GC modified electrode was applied successfully for the analysis of rutin in pharmaceutical samples. The studies indicated that the Ni-GO/GCE exhibited remarkable electrocatalytic activity for the electrooxidation of rutin, which lead to the sensitive, easy and cheap method was established to analyze of rutin in pharmaceutical formulations. References [1] C. Manach, A. Scalbert, C. Morand, C. Remesy, L. Jimenez, Am. J. Clin. Nutr. 2004 (79) 727–747. [2] A. J. Blasco, M. C. Gonzalez, A. Escarpa, Anal. Chim. Acta 2004 (511) 71–81.

Keyword: metal nanoparticle, metal oxide, graphene oxide, rutin
ID 327

Microstructural And Mechanical Properties Of Ceramic Coated Open-Cell Aluminum Foams Through Plasma Electrolytic Oxidation

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Plasma electrolytic oxidation (PEO) treatment is carried out to improve the mechanical properties of the open-cell aluminum foams. Composite foams are produced with metal-cored ceramic networks. Two different pore size of open-cell aluminum foams (20 PPI and 40 PPI) were treated in an alkaline solution at different current densities and durations. The microstructure and phase composition of samples were investigated by scanning electron microscope (SEM) and X-ray diffraction (XRD) respectively. The coating thickness of the struts was increased with the increasing of treatment duration. Ceramic coatings were composed of oxides and silicates. It was found that the compressive properties of the 20 PPI composite foams were significantly improved by using PEO treatment.

Keyword: Composite metal foams; Plasma electrolytic oxidation; Mechanical properties

ID 328

Production Of Silk Impregnated Porous Phbv Nanofiber Mats

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Tissue engineering aims to restore, maintain, or improve tissue function in the body. The scaffold is one of the main components of tissue engineering that provides a suitable environment for cell growth and tissue regeneration. An ideal scaffold should be biocompatible, porous to allow efficient mass transport of nutrients and also mimic the fibrous form of the natural extracellular matrix. Cell attachment is the initial step of new tissue formation and closely related with the wettability of the surface. In order to improve wetting characteristics as well as biocompatibility of synthetic polymers hydrophilic natural polymers can be used for impregnation, however it is a compelling solution due to lack of sufficient interaction sites. In this study, a new approach has been put forward to produce porous and fibrous silk impregnated poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) mats by wet-electrospinning technique. Nanofibers were wet-electrospun (flow rate: 2 mL/h, voltage:20 kV and distance: 10 cm) into a coagulation bath containing silk fibroin (SF) solution and then they were freeze-dried. The morphological properties of the mats were characterized by using scanning electron microscopy. FTIR analysis was performed to prove the presence of SF on the mats. Percent porosity of the mats was measured by mercury porosimetry.

Keyword: PHBV, Silk Fibroin, Nanofiber Mat, Tissue Engineering
Acetic acid steam reforming over Ni impregnated MCM-41 catalyst: Effect of feed composition

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Hydrogen is recognized as a promising clean fuel alternate and an ideal energy carrier [1-3]. Acetic acid is a major component of bio-oil, which is produced through pyrolysis of bio-waste. In the present study, activity of nickel incorporated mesoporous MCM-41 catalyst, namely 10Ni@MCM-41, was tested in steam reforming of acetic acid to produce hydrogen rich syngas. Experiments were repeated with different feed molar ratios of acetic acid and H2O. Ni was incorporated into mesoporous MCM-41 by impregnation (10% wt). The catalyst was characterized by XRD, N2 adsorption-desorption, ICP-MS and SEM, TG/DT techniques. N2 adsorption-desorption isotherm of the catalyst was consistent with Type IV isotherm. In the XRD pattern of the catalyst, characteristic peaks corresponding to MCM-41 and metallic Ni were observed. Activity tests were performed at different acetic acid/H2O molar ratios in the range of 1/2.5 and 1/30, at 750°C. Catalytic activity tests showed that the performance of the catalyst was highly stable with a complete acetic acid conversion. An increase in feed molar ratio of acetic acid/H2O caused an increase in H2 selectivity from 64% to 100%. TG/DT analysis showed that almost no coke formation was obtained over the spent 10Ni@MCM-41 catalyst after activity tests with acetic acid/H2O molar ratio of 1/30, at 750°C.

References

Acknowledgement
Turkish Scientific and Technical Research Council (TUBITAK) grant (214M578) and Gazi University BAP 06/2017-03 supports are gratefully acknowledged.

Keywords: Hydrogen, Acetic acid stem reforming, Ni@MCM-41 catalyst
Activity Tests of Alumina Supported Ni and Co Catalysts in Acetic Acid Steam Reforming Reaction
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Fossil fuels are more harmful than renewable energy sources considering air and water pollution, public health and global warming emissions. Hydrogen energy has become an important research area worldwide for environmental-friendly and sustainable energy development [1-3]. Bio-oil based acetic acid is a potential renewable resource for hydrogen production. In this study, activity of mesoporous Al2O3 (MA) supported nickel and cobalt catalysts (Ni@MA and Co@MA) were investigated in acetic acid steam reforming reaction. Ni or Co (5%wt) were impregnated into the structure of mesoporous Al2O3. The catalysts were characterized by XRD, N2 adsorption-desorption, SEM and TG/DT techniques before and after activity tests. N2 adsorption-desorption isotherms of the catalysts were consistent with Type IV isotherm. In the XRD pattern of the catalysts, characteristic peaks corresponding to γ-alumina were observed. Activity tests were performed at 750°C with an acetic acid/H2O/Ar molar ratio of 1.0/2.5/2.0. Results showed that Ni catalysts gave highly promising results with a complete acetic acid conversion and high hydrogen yield. The H2 selectivity value obtained with Ni@MA was more than 5 times higher than the hydrogen selectivity values obtained with pure alumina (MA), and Co@MA. TG/DT analysis showed that coke formation decreased with incorporation of Ni and Co into the structure of alumina.

References

Acknowledgement
Turkish Scientific and Technical Research Council (TUBITAK) grant (214M578).

Keywords: Hydrogen production, acetic acid steam reforming, Ni@Alumina, Co@Alumina

Effect of Solution and Calcination Time on Sol-Gel Synthesis of Hydroxyapatite
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Nano-sized hydroxyapatite (HA) particles were prepared by sol-gel through water and ethanol based solutions of calcium hydroxide (Ca [(OH) 2] and phosphoric acid (H_3 PO_4) at pH 11 for different calcination time (1h, 2h, 4h). The influence of calcination time and solution on the crystallinity, morphology and impurity phases of the HA nanoparticles were investigated using X-ray diffraction (XRD), Fourier transform infrared (FTIR), energy dispersive X-ray spectroscopy (EDS) and scanning electron microscopy (SEM). It was found that the fraction crystallinity and crystallite size increased with the increase of calcination time; while only Calcium oxide (CaO) as impurity appears in the water-based phase, CaO as well as Ca [(OH) 2 impurities appears in the ethanol-based phase. As a result, the employed water-based sol-gel processes for 4h calcination time was determined as the optimum for the production of nano-sized HA powders using calcium hydroxide and phosphoric acid.

Keywords: Hydroxyapatite, Calcination Time, XRD, Sol-gel
Considerable effort has been devoted to produce porous SiC-Si3N4 ceramics for various applications by using numerous shaping techniques. In this study, starch consolidation technique was used to produce SiC-Si3N4 porous ceramics. Borax decahydrate (Na2B4O7.10H2O) was used as sintering additive to decrease the sintering temperature. SiC, Si3N4, borax decahydrate and corn starch containing suspensions were prepared in a planetary ball mill. SiC-Si3N4 green bodies were manufactured by heating the prepared ceramic suspensions in non-porous molds at low temperature (< 80oC). Then starch was removed from the structure by burning out process at 650oC, while final sodium borate-bonded SiC ceramics were achieved by sintering at <1000oC, at atmospheric conditions. Borax decahydrate facilitates sintering via providing a lower viscosity melt at reduced temperature but at these conditions, cristobalite phase was precipitated from the glassy phase during the cooling process. In this study composition design was carried out to prevent the formation of cristobalite phase. The effects of sintering time-temperature and starch content on the porosity of the ceramics will be investigated.

**Keywords:** Si3N4, SiC, borax decahydrate, low sintering temperature

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Paints are most commonly used in surface coatings as protection and decorative reasons; however in case of fire and high temperatures, they expose lots of smoke and very flammable, toxic products. To prevent loss of life and property in fire situations, addition of flame retardants/inhibitors and mineral additive products onto textile, wooden and plastic products are necessary. Boron, with widely usage areas, low volatility value, high ignition temperature, emission free and not causing toxic gas features is popular among fire retardant products. Boron based fire retardants forms glassy protective layer that covers burning material ensuring to cut its connection with O2, just as Ammonium polyphosphate based fire retardants. In this study, water based paint contains ammonium polyphosphate (APP)(powder form) has prepared and tested. Sample contained 1.4 kg/m2 paint. Results shows that APP contained paint gains 120 minutes of flame resistant and no ignition and inflammation on surface has observed according to EN 14135 standards. Boron compounds will be added to this paint in different amounts to improve flame resistance and to improve LOI values.

**Keywords:** Ammonium Polyphosphate(APP), Boron, Paint
Effect of Pressure on Direct Dimethyl Ether (DME) Synthesis from Syngas over Tungstophosphoric Acid (TPA) Impregnated Mesoporous Alumina Catalyst

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DME is an environmentally friendly multimarket product that is used as an alternative diesel fuel. In recent years heteropoly acids attracted much interest for DME synthesis due to their high catalytic activity and having stronger Bronsted acid sites. In this study, direct DME synthesis from syngas was investigated over mesoporous alumina supported TPA based catalysts. These catalysts were characterized by XRD, N₂ physisorption and pyridine adsorbed DRIFTS techniques. Synthesized mesoporous alumina had surface area and mean pore diameter values of 282 m²/g and 7.9 nm, respectively. Some decrease observed in the surface area and pore diameter as a result of 25(wt)% TPA impregnation, which indicated decrease of pore dimensions as a result of deposition of TPA on the pore walls. DRIFTS results showed that TPA incorporation increased surface acidity of the catalyst. Activity tests were performed in a pressure range of 30-50 bar, at 275 °C. Results showed that an increase in pressure caused an increase in the CO conversion (from 17% to 57%). On the other hand TPA based catalyst was more active and gave high CO conversion and DME selectivity values, approaching to 53% DME selectivity.

References

Acknowledgements
Financial support of TUBITAK 115M377 and Gazi University Research Funds (BAP 06/2017-09) were gratefully acknowledged.

Keywords: Dimethyl Ether (DME), Tungstophosphoric Acid (TPA), Alumina

Effects Of Cobalt And Iron Alternation On The Binder Phase Composition And Average Grain Size Of W-Ni-X Heavy Alloys

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Ni and other suitable transition metals are generally employed during liquid phase sintering treatments of tungsten heavy alloys. In this study, the effects of utilization of Co powder instead of Fe powder on sintered heavy alloys characteristics, including densification ability and microstructural variations, were investigated. 90 wt% W contained green compacts were sintered at three different sintering temperatures from 1450 to 1550 °C for 1 hour under reducing (H₂) gas atmosphere. Archimedes’ principle was used during relative density measurements. Micro and macro scale hardness tests were performed to investigate the altered additive effects on hardness values. Furthermore, binder phase compositions, average grain sizes and % binder phase area variations were examined by means of scanning electron microscope (SEM), energy dispersive spectrocope (EDS) and optical microscope. The conducted investigations have pointed out that Fe employed 90W-7Ni-3Fe alloys can dissolve approximately 26 wt% W in binder phase, whereas Co employed alloys has higher than 40 wt% W dissolved binder phase. The enhanced solubility typically caused formation of relatively coarsened W grains. In addition, owing to decreased W contiguity, Co added 90W-7Ni-3Co heavy alloys demonstrated slight shape distortion when sintered at 1550 °C.

Keyword: Tungsten heavy alloys, liquid phase sintering, cobalt addition, grain growth, shape distortion.
Adsorptive Removal Of Methylene Blue And Methyl Orange From Aqueous Solutions Using Glycidyl Methacrylate Based Polymer Functionalized With Diethylenetriamine Tetra Acetic Acid

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Dyes are an important class of pollutants. Disposal of dyes in precious water resources must be avoided since they pose significant threats to the environment and public health. Thus, efficient treatment methods are required for their removal from waters. In the present study, a novel adsorbent, macroporous glycidyl methacrylate (GMA)–methylmethacrylate (MMA)–divinyl benzene (DVB) terpolymer functionalized with diethylenetriamine tetra acetic acid (DTTA), (GMA-MMA-DVB-DTTA) was synthesized and applied for the removal of methylene blue (MB) and methyl orange (MO) which are used as models for cationic and anionic dyes, respectively. The impact of several variables on the adsorption process such as pH (2–12), adsorbent dose (0.01–0.06 g) and contact time (10–120 min) were studied. Some isotherm (Langmuir, Freundlich and Dubinin-Radushkevich) and kinetic (pseudo-first-order, pseudo-second-order and intraparticle diffusion) models were employed to provide better understanding about the adsorption characteristics and efficiency. The novel sorbent worked efficiently in aqueous solutions with acceptable accuracy and precision. The results suggested that GMA-MMA-DVB-DTTA could be employed as efficient and suitable adsorbent for the removal of MB and MO from water samples.

Keyword: removal, methylene blue, methyl orange, polymer, waters

Improvement for Welded of Different Aluminum Plates with Coating Processes

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Aluminum materials are known to be used extensively in machine manufacturing industry, aerospace and space, where industrial production is made. They have good heat and electrical conductivity, light weight, increased strength properties and good corrosion resistance and it is known as a great advantage to provide less energy consumption. For these reasons, the necessity of joining different aluminum alloys with welding has arisen. Welding is a manufacturing method to join materials with each other. In this method the part to be welded of the working parts is usually melted and the filling material is added to this part, then the joint is cooled and hardened. Today, MIG / MAG, TIG, Laser etc. In this study, aluminum sheets were welded by GTAW. The TIG welding method is an arc welding method in which the heat required for welding is generated by an arc formed between the work piece and a non-consumable electrode (tungsten electrode). The welded areas of different aluminum sheets joined with GTAW were coated with micro-arc oxidation method using ceramic powders to investigate the effect of coating on the weldability. Microstructure examination and mechanical analysis were carried out in order to determine the mechanical properties of different aluminum sheets joined with TIG welding.

Keywords: Aluminum alloys, Laser welding, Microarc oxidation
ID 341

Composites Produced By Waste Iron Powder With Addition Of Carbon Nanotubes
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Composite materials have begun to take the place of traditional materials from the day they started to develop. Especially, their usage of them in aerospace, aircraft and automotive industries has been increased considerably. Innovative materials have been provided for many application fields by the development of carbon nanotube composite material. Carbon nanotubes are one of the carbon allotropes that have become increasingly important in recent years. High-tech product carbon nanostructures are being used in most fields as well as composite materials applications. Carbon nanostructure reinforcements bring significant improvements in the mechanical and thermal properties of composites. Waste iron dusts are important for waste recovery, although it is not preferred too much as a matrix in composite materials alone. The waste iron powders used in this study were obtained by separating from the mold sand used in the casting industry. In the present study, composites containing waste iron dust were used with carbon nanotube reinforcement. Thus, mechanical properties have been tried to be improved, contributing to waste recovery. It has been tried to obtain optimum mechanical properties by using the stiffening effect of the reinforcing material at different ratios, different sintering temperatures and durations. The production processes were carried out by applying pressures gradually under cold pressing and polymer-based binders were used to make compact materials.

Keyword: Waste steel scale, carbon nano tube, composites

ID 342

Mechanical, Thermal, And Morphology Properties Of Poly (Lactic Acid) Plasticized With Atbc And Monoterpenic Phenols
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In recent decades, biodegradable and renewable polymers have intensively attracted attention due to their huge influence on reducing the environmental pollution. Polylactic acid (PLA) is one of the most studied biodegradable polymers mainly because of its high mechanical properties and the relatively easy production from its monomer. In this present study, monoterpenic phenols and Acetyl Tributyl Citrate (ATBC) are used in combination to improve the PLA properties and expand the application areas. Plasticized PLA showed that lowering the glass transition temperature (Tg) and melting temperature (Tm), increasing the crystallinity depending on the content. According to TGA results; ATBC and monoterpenic phenols caused a little decrease in thermal stability. As a consequence of plasticization effect with the addition of ATBC and monoterpenic phenols mechanical properties changed. Tensile strength and Young modulus decreased and elongation at break increased with the plasticizer content. Sample images with the plasticizer getting from SEM showed plastic deformation, while neat PLA exhibited brittle fracture morphology. FTIR spectra pointed out that there are some molecular interactions between ATBC and PLA by intermolecular hydrogen bonds and some differences with the addition of monoterpenic phenols.

Keyword: poly (lactic acid), composite, biodegradable
The homogeneous particle distribution in composite films is one of the major parameters that affect the mechanical properties significantly. To provide homogeneity, a robust interaction between the particle reinforcement/filler and polymer matrix should be established. The silane surface modification is applied to the inorganic fillers to promote the interaction, however the van der waals and hydrogen bonding are necessary for organic type of particle reinforced composite films. If the polymer has non-polar characteristics there will be no connection between the constituents of the hybrid system. In addition to that, a strong hydrogen bonding can be observed when both the polymer and filler have polar structures. These mentioned interactions lead to more homogeneous particle distribution in the matrix phase.

In this study, the organic dyes with different polar groups were integrated with non-polar polyethylene (PE) and polar polymethylmethacrylate (PMMA) to produce composite thin films. The prepared films were investigated with dynamic mechanical analyzer (DMA) to accurately understand the polymer-filler interaction on the thermomechanical properties of the composites.

**Keywords:** Composite films, DMA, Mechanical Properties, Polymer matrix, Organic reinforcement

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Innovative work in heat management technology for high power LED lighting systems is based on ceramic backing materials. Thus, polymer based masks which has low thermal conductivity will not need to be used to obtain electrical insulating between the substrate end the Led chip. So, the heat can be removed more rapidly from the LED chip. By this way LED life time can be extended. The 80% of the generated heat in the LEDs must be removed very quickly to prevent degradation of the LED chip.

The ability to use a lower cost method for the production of thermal management components as compared to expansive methods is important for the price/performance of high power LED devices. As a result, it is necessary to use materials with a very high thermal conductivity in the thermal management and to reduce the production costs of these parts, in addition to being low cost, as well as high performance LED production.

The biggest obstacle to low-cost production of LED modules is the need for materials with reasonable manufacturing costs and high conductivity. Our approach to overcome this obstacle is to investigate the production of AlN coatings by low cost methods, and thus to improve the thermal performance of the LEDs.

**Keywords:** LEDs and AlN thin films
The Production And Characterization Of Nanoparticle Reinforced Thermoplastic Polymer Thin Films

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Organic/inorganic reinforcement materials in polymeric systems are generally used to improve the properties of composites and reduce the production cost. There has been an extensive increase for developing the nanocomposites in 30 years. Nano-composites exhibit remarkable improvement in materials properties when compared with pure polymer or conventional micro/macro composites. Although there are several works in literature, the manufacturing of polymer nano-composites as thin films has been started recently. The thin films having electrical, magnetic or optic features are frequently employed in electronics, photonics and sensor applications. These films with multifunctional properties are also used to modify the surface characteristics of coatings. In this study, nano-clay acted as the reinforcement phase of the composite and polymethylmethacrylate (PMMA) was chosen as matrix. Surface modification of the nano-clay is important for establishing a robust interfacial area. For this purpose, the clay particles were silanized and the characterizations of the prepared samples were performed by FTIR and XRD. The thin films were obtained by solvent casting technique with the addition of pure clay, silanized clay and surfactant silane clay in various mass percentages into the PMMA. The mechanical properties of the thin films were examined with DMA while TEM was used to reveal the morphologies of the thin films.

Keyword: Polymer Thin Films, Inorganic Reinforcement, Nano clay, DMA

Production and Characterization of Active Carbon Obtained from Active Sludge by Chemical Activation

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Active sludge technology is widely used all over the world. For environmental and ecological reasons, the disposal of these sludges has become immensely important. The aim of this study was to evaluate the sludge produced in biological treatment systems as active carbon. In this study, the chemically activated sludge was produced. Sample of active sludge were collected from a membrane bioreactor (MBR) system. The active sludge (containing Trametes versicolor) was used for the decolorization of simulated textile wastewater in MBR. In the chemical activation, dried sludge was activated with concentrated sulfuric acid at 200°C for 1h. Heating was stopped while the produced material became a carbon-like material. Then the sample was soaked in 1 M sodium hydroxide solution for 30 min; washed with distilled water and dried. Chemically treated and untreated samples were analyzed with Scanning electron microscope (SEM), nitrogen adsorption measurements, Fourier Transform Infrared Spectroscopy (FTIR), Zeta potential measurements. Chemically treated and untreated samples were compared with their chemical structure and morphological properties. The obtained results showed that the treatment improved the surface characteristics of the activated sludge sample, so the sludge obtained from MBR system is evaluated to produce the activated carbon.

Keywords: Active carbon, active sludge, characterization, chemical activation, membrane bioreactor, Trametes versicolor
ID 347

Corrosion Behaviour of Inconel 718 Superalloys Produced By Electric Current Assisted Sintering

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Corrosion behaviours of Inconel 718 superalloy produced by electric current activated sintering method using elemental powders (Al, Ni, Fe, Cr, Ti, Co, Nb and Mo) were investigated. These powders were mixed in stoichiometric ratio corresponding to the Inconel 718 material. The production process was carried out in electric current rectifier in open air at 1700-2300A for 10 minutes. In order to balance the strength and ductility, the produced sample was given the standard heat treatment. The microstructures and phase constitutions of the samples were characterized by scanning electron microscopy (SEM-EDS) and X-ray diffraction (XRD). The relative density of the samples measured according to Archimedes’ principle was 94.6%. The hardness value of synthesized sample and heat treated sample were approximately 244,3±17 and 343,8±11 respectively. In addition, the corrosion behaviors of the produced samples were determined using by electrochemical impedance spectroscopy (EIS) measurements in %3,5 NaCl solution. Their morphology as on the surfaces were observed by SEM-EDS and XRD analyses.

Keywords: Superalloys, Inconel 718, Electric Current Activated Sintering, Corrosion

ID 348

Synthesis of Stellite 21 Co-based Superalloy Produced by Resistance Sintering Method

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In the present study, Stellite 21 cobalt-based superalloy produced by resistance sintering using elemental powders (Co, Cr, Mo, Ni, Fe, Mn, C and Si) in open air under a uniaxial pressure of 250MPa by using 4580A – 3.5V for 34min. was characterized. The sample was given the heat treatment as follows: 4 h solution treatment at 1200°C followed by cooling in water and ageing treatment consisting of 815°C for 4h/furnace cooling. The microstructures and phase constituents were characterized by optical microscopy (OM), scanning electron microscopy (SEM+EDS) and X-ray diffraction (XRD). Hardness of sintered specimens was determined by using micro-hardness tester on polished cross-sectional surface. The hardness of the samples was approximately 43.4±1.14 HRC. Microstructure examinations showed that a high density specimen with low porosity was achieved. Based on the Archimedes principle, the after sintering relative density of the samples was measured to be 96.6%.

Keywords: Stellite 21, Co-based superalloys, sintering
ID 349

Epoxy/Nano-Clay Based Composites: Effect Of Organic Dye Addition On The Mechanical And Thermomechanical Properties

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Nano sized inorganic powder reinforced polymer composites have been attracting considerable attention in recent years because of their prominent effects. Various nano-powders (silica, clay, carbon nano-tubes and grapheme) are investigated in numerous studies by many researchers. In particular, polymer/nanoclay composites play an important role to reveal the performance of nano-composites since their discovery in 1980s. Many polymers have been incorporated with various ratios of nano-clay to improve the physical, optical and mechanical properties. The development in the mechanical properties of polymers, with a simultaneous providing color, can be obtained with the introduction organic dye and inorganic mineral together. However there are limited studies about the combination of organic and inorganic fillers in a composite. In this study, to observe the reinforcement and coloring effects in single combined process the dye phase introduced nano-clay/epoxy composites were produced. A commercial dye methyl orange (MO) was used as the organic dye and three different powder ratios (0.5, 1 and 2% wt.) were determined to choose the optimum percentage. Nano-clay/epoxy and MO/epoxy samples were produced separately and they were subjected to tensile and flexural tests. The 0.5% wt. powder loaded composites exhibited the best performance for both nano-clay and MO. In addition to that, clay particles were modified with surfactant and silane agent in a single process to improve the interfacial bonding. All the manufactured composites were characterized by DMA and the morphologies of the samples were revealed by TEM.

Keyword: Nano-composites, inorgani and organic filler, mechanical properties

ID 350

Effects of Co Doping on Structural and Optical Properties of ZnO Nanopowders Synthesized via Spray Drying Subsequent Thermal Decomposition

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This study was presented on the spray drying subsequent thermal decomposition synthesis of Co doped ZnO nanopowders. Different concentrations of cobalt acetate were used for dopant from 0.01 M to 0.05 M in spray drying slurries containing zinc acetate powders. Spray drying conditions like inlet temperature, feed rate and drying air flow rate were adjusted 200 oC, 3 ml/min. and 800 ml/min, respectively. The obtained powders were thermally decomposed at 300 oC for 12 h in air atmosphere at 2 oC min−1. The study aimed to investigate the effects of Co doping on the structural and optical properties of ZnO nanopowders. The synthesized samples were characterized by a variety of characterization techniques such as XRD, SEM, BET and UV–vis spectroscopy. It was observed from XRD results that synthesized powders had hexagonal wurtzite structure. BET analysis showed a decrease in surface area values with increasing dopant concentration. It has been determined that morphology of the nanoparticles is affected by Co dopant in SEM examinations of ZnO nanopowders. Moreover, the UV-vis study showed that different amounts of Co dopant played a role on optical properties of ZnO nanopowders.

Keyword: ZnO, Co, Spray drying, Thermal decomposition.
Polybutylene terephthalate (PBT) is an amorphous or semi-crystalline thermoplastic that possess high molecular weight, superior heat and chemical resistance with perfect dimensional stability. It also shows prominent mechanical and electrical properties that can be utilized in many industrial applications. The ethylene propylene diene terpolymer (EPDM) is a synthetic elastomer, which does not lose its mechanical characteristics at high processing temperatures. Based on the literature, the EPDM addition generally improves the toughness and impact properties of the composite systems. In this study, thermoplastic PBT was reinforced with EPDM particles to observe the effects of an elastomeric polymer. The %10 and %20 wt. EPDM was firstly mixed with PBT granules and then subjected to polymer injection molding. Composite structures as well as neat PBT and EPDM were subjected to tensile and three point bending (3PB) tests according to the ASTM standards. The morphological characterization of the samples was performed via scanning electron microscopy (SEM).

**Keywords:** elastomer filler, thermoplastic matrix, mechanical properties

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Ti-48Al-2Cr-2Mo-0.5Si alloy was produced via electric current activated sintering (ECAS) at a maximum of 3500 A for 30 min. Scanning electron microscopy (SEM-EDS) and X-ray diffraction analysis (XRD) were used to characterize the microstructures and phase constitutions of the sample. The relative density of the sample measured according to Archimedes’ principle was 99.5%, and the hardness value of synthesized alloy was approximately 460±63 HV0.05. Hot corrosion behavior of the samples was investigated in 75 wt% K2SO4 + 25 wt% Na2SO4 environment at 700 °C. The hot corrosion rate was evaluated on the basis of mass change measurements. After hot corrosion, surface and cross-section of the sample were observed by SEM-EDS. Phase identification of the corrosion products was performed by XRD. X-ray diffraction studies revealed that main corrosion products were TiO2 and Al2O3.

**Keywords:** ECAS, Hot corrosion
ID 353

Development Of W And Zr Containing Acidic Catalysts For Cetyl Palmitate Synthesis

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Esters of fatty acids and alcohols are used as raw materials for emulsifiers, oiling agents and surfactants in different industrial areas. Cetyl palmitate is one of the most important cetyl esters for cosmetics industry. In the present study, it was aimed to develop active, selective and reusable heterogeneous catalysts for esterification of cetyl alcohol by palmitic acid. For this purpose, WO3-ZrO2 catalyst was prepared by co-precipitation with three different contents of WO3 (10, 15 and 20 wt%) and calcined at two different temperatures (700 – 800 oC). The catalysts were characterized by XRD, Raman, BET, NH3-TPD and FTIR. The reaction tests were carried out in mesitylene under reflux conditions within 6 h reaction time. WZ158 catalyst which had the highest amount of Brønsted acid sites gave maximum cetyl palmitate yield (See Table 1). This catalyst retained its activity up to 3 reuse cycles without significant loss of activity. Table 1 Initial rate of disappearance and conversion of cetyl alcohol and yield of cetyl palmitate over different catalysts

<table>
<thead>
<tr>
<th>Catalysts</th>
<th>r0x105 (mol/min g)</th>
<th>Conversion (%)</th>
<th>Yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WZ107</td>
<td>10.3</td>
<td>53.8</td>
<td>52.7</td>
</tr>
<tr>
<td>WZ157</td>
<td>21.5</td>
<td>88.3</td>
<td>87.3</td>
</tr>
<tr>
<td>WZ207</td>
<td>25.6</td>
<td>91.3</td>
<td>90.8</td>
</tr>
<tr>
<td>WZ108</td>
<td>25.5</td>
<td>92.7</td>
<td>92.4</td>
</tr>
<tr>
<td>WZ158</td>
<td>44.3</td>
<td>99.5</td>
<td>99.4</td>
</tr>
<tr>
<td>WZ208</td>
<td>40.0</td>
<td>95.5</td>
<td>92.9</td>
</tr>
</tbody>
</table>

r0/TA is defined as r0x105 per total acidity

This study was founded by TUBITAK as project number 112M701. Their support is gratefully acknowledged.


This study was founded by TUBITAK as project number 112M701. Their support is gratefully acknowledged.

Keyword: heterogeneous catalysts, WO3-ZrO2 catalysts, esterification

ID 355

Modeling of Liquid Composite Molding with Particle-Filled Resin through Heterogeneous Fibrous Media

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Liquid Composite Molding (LCM) is one of the most popular manufacturing method for its short cycle times, low cost, high quality and ability to handle complex geometries to satisfy the needs of efficient and lightweight advanced composite materials. Additional to its advantages, the products of LCM are now required to include various functionalities. These functionalities such as increased toughness can be obtained with particle fillers which are mixed with the resin system prior to injection. Also, improved through-thickness properties such as minimizing the delamination can be achieved with placement of nanotube sheets between the fiber layers. In this study, a mathematical model to represent the flow during LCM process of particle-filled resin system through heterogeneous porous domain composed of fibers and nanotube sheets will be introduced. This multi-dimensional model will consider the filtration of the particles and the changes of permeability, viscosity and porosity with filtration. Then, the model will be examined with simulation to understand the relationship between the process parameters (inlet/vent locations, inlet pressure, particle concentration, permeability, etc.) and the filling success and particle distribution with the domain. The simulations will be tested for different cases and the optimum process parameters will be suggested for desired conditions.

Keyword: Liquid Composite Molding, Filtration, Process Modeling
Pistachio Pollens for Porous Metal Oxide Nanoparticle Production

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The natural bio templates like bacteria, fungi, viruses have been used in metal oxide nanoparticle production. The pollens can be found abundantly in the nature and their microcapsules can be easily isolated from the pollens by chemical treatments. So far, pollen microcapsules are generally used as drug carriers, catalytic agent templates. In this study, we have produced nanoporous structured nickel oxide nanoparticles using Pistachio pollen microcapsules. The raw pollens, chemically treated pollens and metal coated pollens were characterized using SEM, BET and DTA/ TGA, XRD techniques. The natural Pistachio pollens which procured from Gaziantep-Turkey are spherical with a diameter of ~23 µm. The maximum surface area was obtained for nickel oxide coated microcapsules as 84.46 m²/g. This shows that pollens are excellent candidate to produce porous nanomaterials for supercapacitor electrodes.

Keywords: nickel oxide, supercapacitor, pollen, nanomaterials

Synthesis Of Styrene Divinylbenzene Microspheres By Suspension Polimerization

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In this study, formation of styrene divinyl benzene microspheres which can be used for ion exchange resin and the affecting parameters to formation by use of suspension polymerization method, were investigated. Stirring rate, polymerization temperature, polymerization duration, stabilizer concentration and monomer/water ratio are the parameters investigated. Studies were conducted in batch mode with coated reactor made by pyrex glass. First, produced microspheres’ surface area, size and uniformity were researched while monomer/water ratio of 1/4, stirring rate of 500 rpm and stabilizer concentration of 0,4% g by weight were kept constant. Microspheres produced at 8,19 m²/g surface area, 75°C temperature and 7 hour processing were selected to be the most suitable. According to result obtained stirring rates of 100, 200, 300 and 400 rpm were tested which showed that decrease in stirring rate increased microsphere dimension. Monomer/water ratio was found to be non effective. If the ratio was under 1/4, the formation of product was low and if it was above, formation of product was more.

Keyword: Suspension polymerization, Styrene divinyl benzene microspheres, Styrene, Divinylbenzene, Microsphere
Characterization And Modification Of Hollow Mullite Microspheres For The Application Of Polymer-Matrix Composites

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A hollow ceramic microsphere (HCM) consists of inner gas and outer a stiff ceramic shell, which has a low density, thermal conductivity and dielectric property. These properties make it become a promising insulation additives. In this study, Potential application of hollow mullite microsphere (HMM) as a filler materials for polymer matrix composites were investigated. Firstly, the properties of HMMs powders were characterized by SEM, XRD, particle size and thermal analysis (TGA/DTA) techniques. In order to increase properties of composites, the interaction between filler particle and matrix should be maximized. Therefore, the surface of HMM powders were modified with different coupling agents (silanes). The surface modification was controlled by FTIR analysis.
Keyword: Hollow microsphere, Mullite, Characterization, surface modification

Investigation Of Antibacterial Activities Of Znfe2O4 / Ag -TiO2 Nanocomposites

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The magnetic nanoparticles (MNPs) need modification to increase the biocompatibility and bacterial activity before implementation for drug delivery applications [Sanpo et al., 2013]. However, the biomedical application of these newly-synthesized nanoparticles requires further study concerning their biocompatibility and antibacterial properties [Sanpo et al., 2012; Sanpo et al., 2013]. The silver nanoparticles with their unique chemical and physical properties are proving as an alternative for the development of new antibacterial agents. Silver nanoparticles doped in nano TiO2 are one of the methods that can improve silver antibacterial activity [Gordin et al., 2013; Allafchian et al., 2016]. In this study, ZnFe2O4 MNPs were successfully synthesized and the as-prepared ZnFe2O4 MNPs were stable and well-dispersed. For increasing the antibacterial activity properties, the silver nanoparticles were doped on the surface of TiO2. Then, we achieved to fabricate ZnFe2O4 MNPs on Ag-TiO2 surface. The nanocomposites were characterized by Fourier-transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD) and magnetization measurement (VSM). In addition, the antimicrobial activity of samples was investigated against Escherichia coli and Staphylococcus aureus bacteria. REFERENCES Sanpo, N., Berndt, C.C., Wen, C., Wang, J., 2013. Transition metal-substituted cobalt ferrite nanoparticles for biomedical applications, Acta Biomater., 9, 5830. Sanpo, N., Berndt, C.C., Wang, J., 2012. Microstructural and antibacterial properties of zinc-substituted cobalt ferrite nanopowders synthesized by sol-gel methods, J. Appl. Phys., 112, 1. Sanpo, N., Wen, C., Berndt, C.C., Wang, J., 2013. Antibacterial properties of spinel ferrite nanoparticles, in: Microbial Pathogens and Strategies for Combating Them: Science, Technology and Education (A. Méndez-Vilas, Ed.), 239. Gordin, D., Busardo, D., Cimpean, A., Vasilescu, C., Höche, D., Drob, S., Mitran, V., Cornen, M., Gloriant, T., 2013. Design of a nitrogen-implanted titanium-based superelastic alloy with optimized properties for biomedical applications, Mater. Sci. Eng. C, 33, 4173. Allafchian, A., Jalali, S.A.H., Bahramian, H., Ahmadvand, H., 2016. Preparation, characterization, and antibacterial activity of NiFe2O4/PAMA/Ag–TiO2 nanocomposite, Journal of Magnetism and Magnetic Materials, 404, 14.
Aerogels exhibit many fascinating properties, such as low mass densities, continuous porosities and high surface areas. Aerogel microstructures typically consist of three-dimensional (3D) networks of interconnected nanometer-sized primary particles. 3D aerogel nanoarchitectures have recently attracted significant attention for lithium/sodium energy storage applications by offering sufficient contact area between the electrolyte and electrode, high-rate transportation of ions and electrons, and short solid-state ion diffusion lengths. These properties favor the use of 3D aerogel nanomaterials in advanced PHEVs and EVs with rapid charge and discharge requirements.

Here we summarized these new materials, aerogels that used for energy storage and conversation devices such as batteries, supercapacitors, in the literature. Synthesis, characterization and electrochemical performances of carbon aerogels and their precursory polymer aerogels [1], functionalized graphene aerogels [2, 3, 4], metal oxide/graphene hybrid aerogels [5, 6, 7] and derivatives of many aerogels were investigated and discussed.

Acknowledgements
This study has been executing under TÜBİTAK project (Grant number: 315M250) which is about aerogels for batteries.

Keywords: Aerogels, Graphene, Batteries, Supercapacitors,
Supression Of Coke Yield And Hot Spot Problem Of Delayed Coker Units In Oil Refineries By Catalytic Additives

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Refineries are forced to process heavier oils due to depletion of world’s light oil reserves and increasing demand of petroleum products. Delayed coker units (DCUs) are upgrading technologies utilizing thermal cracking process to maximize value added products from heavy oil feedstocks resulting in daily M$ profits. Heavy oil streams are converted into coke, undesired by product, gas and liquids during upgrading. However, hotspot problems are encountered in DCUs due to existence of different coke types (shot, sponge or transitional types). Feed chemistry and operational parameters determine hot spot formation tendencies as well as product quality, and yields. Aim of this study is to suppress hot spot tendency and decrease coke yield by screening varying catalytic additives such as spent refinery catalysts, metal oxides and inorganic compounds. Their performance on liquid quality, coke yield and morphology were studied by 10cc bomb reactor at 490°C, 1 hour. Gas and liquids were analyzed by GC-RGA, and GC-Simdis. Cokes were analyzed by BET and SEM for morphological studies. Coke yield was successfully decreased by ~10%wt. Additives having high surface area did not only decrease coke yield, but also increased liquid yields & quality with altered coke morphology. Future work will be on different feedstocks by semi-batch lab scale unit.

Keyword: Refinery, delayed coker, additive, hot spot

Recovery Of Oil From Refinery Oil Sludge

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650,000 m³ of oil sludge is produced annually in Europe during refinery and petrochemical operations. The sludge is mostly formed at the bottom of storage tanks as a result of accumulation of sediments. A typical composition for sludge can be given as 10-12% solids, 30-50% water and 30-50% oil. These values indicate that sludge contains a considerable amount of oil that can be recovered and used. The sludge also contains heavy metals, which can be used as catalyst once the hydrocarbon fraction is separated. Therefore, the aim of this work is to study the effect of sludge/solvent ratio on oil recovery performance and to investigate catalytic potential of the remaining solid powder. The oil sludge is obtained from Tupras Kırıkkale Refinery. Sludge/solvent ratios ranging between 1:1 to 1:5 are used. The boiling point distribution of the recovered oil is studied by SIMDIS. Solid powder that is obtained after oil recovery is characterized by FTIR-ATR, elemental analysis and ICP-OES. Extraction efficiency is determined by the lack of hydrocarbon peaks in FTIR-ATR. Elemental analysis/ICP results are used to elaborate on the catalytic potential of the solid powder. The results indicated that the extraction efficiency increased with increasing solvent(sludge ratio).

Keyword: Refinery, oil sludge, recovery
Tannic Acid-Reduced and Pd Nps Decorated Graphene Oxide Nanocomposite for Glucose Oxidase Based Biosensor

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Today, a large number of studies upon the fabrication of third generation enzyme based biosensors (TGB) have been conducting by many researchers. Since, it is difficult to reach the direct electron transfer between the active site of the enzyme and the electrode material for the fabrication of TGB; certain materials enable us to construct the TGB. Graphene derivatives can provide excellent conductivity, high surface area, biocompatibility [1]. In addition, direct electron transfer can be seen in the biosensors, which use the graphene based materials. However, there are still current studies that aim the material synthesis for the TGB. Metal nanoparticles (Np), such as gold, platinum and silver have been using in the electrode materials to improve the electrical conductivity, enzyme loading, and catalytic activity according to the literature [2]. In this study, we aimed to fabricate an enzyme electrode by using tannic acid reduced and Pd Np deposited nanocomposite. Graphene oxide (GO) was prepared according to the modified Hummer method [3] and used as the main conducting material. The natural product tannic acid (TA) was employed in the synthesis process for the reduction of graphene oxide to reduced graphene oxide (rGO) and Pd2+ ions and modification of rGO surface. Herein, TA can bind to the rGO surface through π-π interactions, and enzyme can immobilize to the rGO surface via hydrogen bonds between the GOx and hydroxyl groups of TA. Thus, one-pot synthesis of rGO-Pd Np-GOx was achieved and the obtained system was characterized with SEM, FTIR-ATR, TGA under an inert atmosphere and CV experiments. Glucose measurements were carried out by CV technique using the fabricated biosensor.

References

Keywords: Biosensor, Pd NPs, Graphene oxide, Glucose oxidase, Tannic acid.

ID 376

Determination of Interactions Between Single Wall Carbon Nanotubes and 6-Phenyl-2-Thiouracil using some Spectroscopic Methods (FT-IR, Raman, XRD and NMR)

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SWNTs have become of the most used carbon based nanomaterial because of physical and chemical properties of them. Carbon nanotubes have been used in drug delivery, biosensor, imaging, electronic devices, etc [1-2]. In this study, single wall carbon nanotubes were produced using CVD method [2]. These nanotubes were purified and functionalized with chemical methods and then it was provided interaction of 6-Phenyl-2-Thiouracil molecule with single wall carbon nanotubes. Obtained carbon nanotubes are mixed with some acids such as nitric or sulfuric acids. And in this way oxygen containing groups on the wall of nanotubes and in the ends of nanotubes bonded with chemical. These groups can be COOH, OH or C=O groups. All of the steps were verified and characterized using solid state NMR, FT-IR, Raman and powder XRD spectroscopic methods. As a result, it was observed that the spectroscopic findings were consistent with literature. In order to determine vibrations and various bands of raw and functionalized carbon nanotubes, especially FT-IR and Raman spectrometers were used. Moreover, to show interactions between carbon nanotubes and 6-Phenyl-2-Thiouracil molecule and hybridization of carbon nanotubes, solid state NMR spectrometer was used.

Keywords: Single Walled Carbon Nanotubes, Characterization, Solid State NMR, FT-IR and Raman
Production of Magnetic Activated Carbon and Its Use in Removal of Textile Dye from Aqueous Solution

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The rapid depletion of potable water in recent years has allowed scientists to take an interest in the treatment of wastewater. In particular, studies have been made to develop technologies that enable the adsorption process to be used appropriately and efficiently to remove pollutants. In this study, active carbon (AC) obtained from sugar beet pulp was given magnetic property (MAC). The obtained MAC was characterized by different analysis methods (XRD, VSM, BET etc.). As a result of XRD analysis, magnetite (Fe3O4) was integrated to AC, VSM analysis revealed that magnetic saturation of MAC was 11.2 emu/g, and BET analysis revealed that surface area of MAC was 49 m2/g. The MAC was used to remove textile dye from aqueous solutions. The adsorption experiments were carried out at varying dye concentrations, varying pH, varying temperature conditions. From the results obtained, it has been found that MAC can be used more effectively in solutions having a pH value larger than 7.

Keywords: magnetic activated carbon, textile dye, adsorption

Solvothermal Synthesis of MgFe2O4/TiO2 Nanocomposites and Their Photocatalytic Activities

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Spinel ferrites are of great interest because of their remarkable magnetic and electrical properties with chemical and thermal stabilities for various technological applications [Valenzuela, 2011]. Magnesium ferrite (MgFe2O4) is an important magnetic oxide with spinel structure and n-type semiconducting material. So, it can be used as a heterogeneous catalyst, adsorption and sensor technology [Reddy et. al, 2011; Ilhan et. al, 2015]. TiO2 is used in the photodegradation of organic and inorganic compounds, due to such advantages as high activity behavior in the ultraviolet range of the electromagnetic radiation, their non-toxicity, their stability and their low cost-environmentally friendly nature. To improve photocatalytic performance of TiO2 in the visible light, some modifications are required in the catalyst such as doping of TiO2 catalyst. [Ambati et. al, 2018; Zhang et. al, 2011].

In this study, MgFe2O4/TiO2 nanocomposites were synthesized. The as-prepared products were characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), energy dispersive analysis of X-rays (EDX), diffuse reflectance spectra (DRS), and vibrating sample magnetometer (VSM). The removal of textile dye by MgFe2O4/TiO2 was investigated. Furthermore, the as-obtained products not only have high performance for removing dye, but are also easily retrievable by magnet for recycling.

References
Ambati, R., Gogate, Parag, R., 2018, Ultrasound assisted synthesis of iron doped TiO2 catalyst, Ultrasonics - Sonochemistry 40, 91–100.

Keywords: Dye degradation, TiO2, MgFe2O4.
ID 384

**Formation of TiO2 Nanotube Layers Through Magnetron Sputtering and Electrochemical Anodization**

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In this study, titanium thin layers were deposited on glass substrates by radio-frequency (RF) magnetron sputtering under varying parameters such as sputtering power, sputtering pressure, substrate temperature and target-substrate distance so as to determine optimum sputtering parameters. Subsequent to sputtering processes all the samples electrochemically anodized in different electrolytes and various anodization parameters in a two electrode electrochemical cell. The anodized samples were annealed at 450 °C for 1 h in air in order to obtain TiO2 anatase phase transformation and intended crystalline structure. Subsequent to each production step, the properties of the prepared layers were evaluated though x-ray diffractometer (XRD) and scanning electron microscope (SEM). Finally, the effects of fabrication parameters on crystallographic orientation and morphology of the TiO2 nanotube layers were investigated in details.

**Keyword:** Titanium dioxide; Nanotube; Magnetron Sputtering; Electrochemical Anodization; Film Growth

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ID 385

**Supercritical water gasification of opium alkaloid wastewater with KOH and NaOH catalysts**

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Wastewater generated from opium alkaloid manufacturing is a highly toxic, resistant to treatment and has a high COD (32050 ppm) and TOC content (11500 ppm). Existing treatment methods cannot satisfy the discharge limits specified in Water Pollution Control Regulation (2004). Hydrothermal gasification of wastewaters is investigated for an alternative treatment technique providing a valuable gaseous product. The main gaseous are H2, CH4, CO2, and small percentage of CO and C2-C4 hydrocarbons. Gasification studies were done with 20 mL of wastewater and 0.5 g of NaOH, and KOH catalysts at 300, 400, 500 and 600°C reaction temperatures. A batch-autoclave reactor was used to maintain sub, near and supercritical water medium. The reaction pressures varied 98-440 bar for all runs. The highest COD removals were reached at 600°C, at a ratio of 91% with NaOH and 85.3% with KOH. The gaseous product distribution within the range of 300-600°C changed with temperature and catalyst at all runs. The total molar percentage of H2 and CH4 is approximately 85.9% at 600°C. The total produced gas amount is promoted from 23.3 to 93.6 mol/kg organic C with NaOH and from 35.1 to 92.5 mol/kg organic C with KOH as the temperature increases from 300 to 600°C.

**Keyword:** wastewater, gasification, hydrothermal, hydrogen, methane, treatment, supercritical water
Effect of Compaction Process on The Densification of Different Types of Zirconia Powders
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Zirconia ceramic materials have proved to be important structural ceramics and make them attractive candidates for a number of demanding applications due to their high strength and fracture toughness. In this study, effects of compaction process and conditions on the densification of zirconia powders were investigated. Two different types of zirconia powders partially and fully stabilized zirconia and two different compaction techniques uniaxial pressing (UP) and cold isostatic pressing (CIP) were used. Both types of powder were compacted with both compaction techniques at different pressures (100 MPa-300 MPa). After compaction process, they were pre-sintered up to 1200°C under dilatometer. Archimedes densities of the compacts were measured. Finally, in order to achieve their ultimate strength, shrinkage behavior of selected pre-sintered compacts were investigated again under dilatometer up to 1500°C.

Keywords: Zirconia powders, compaction, dilatometer, cold isostatic pressing

Electrokinetic and electrorheological properties of porous organo-perlite particles
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Perlite is a glassy volcanic rock which consists mainly of fused sodium, potassium, aluminum silicate (greater than 70%) and 3-5% water. Along the Aegean coast, Turkey possesses about 70% of the world’s known perlite reserves. When it is heated at temperatures in the range of 850-1100 °C, it expands 4-35 times of its original volume and is called ‘expanded perlite’. Due to its excellent porous structure and surface chemical properties, expanded perlite has been widely used in many industrial processes such as excellent thermal and acoustical insulator, resists fire and an ultralight weight material. In this study, porous expanded perlite was organically modified with a cationic surfactant. Its structural properties were characterized by using FTIR, TGA, SEM-EDS and XRD techniques. Electro kinetic properties of organo-perlite particles in aqueous and non-aqueous (silicone oil) media were examined by zeta-potential measurements as functions of pH, various electrolytes (NaCl, BaCl2, AlCl3, Na2SO4 and MgCl2), surfactants (CTAB, SDS and Triton-X) and temperature. It was observed that the ζ-potential of expanded perlite shifted from -37 mV to -16 mV after organically modified. The most effective electrolyte and surfactant on the ζ-potential was determined to be trivalent (AlCl3) electrolyte and SDS (anionic surfactant), respectively. Further, the effects of volume fraction, electric field strength, shear rate, shear stress, and temperature onto Electrorheological (ER) behavior of the organo-perlite particles dispersed in silicone oil were investigated. It was observed that ER activities of the ER fluids increased with increasing electric field strength and exhibited the typical shear thinning non-Newtonian viscoelastic behaviors with increasing shear rates.

Keywords: Expanded perlite, zeta potential, electrorheological fluids, smart materials
The aim of this study is to develop carbon-glass polyester hybrid composites. PA66 nonwoven fabrics were incorporated within the composite laminates. Unidirectional carbon (500 gsm) and E-glass (675 gsm) fabrics were used as reinforcement materials. Polyester resin (Polipol-335, Poliya) was used in this study. Cobalt octoate and Methyl ethyl ketone peroxide were used as resin accelerator and hardener with a weight ratio of 0.5% and 1.5% respectively. Composite laminates were manufactured by vacuum infusion technique. Vacuum infusion technique has various advantages such as; high fiber/resin ratio, complex shape production, low tooling cost, etc. The test samples were designated as Carbon/E-Glass(0/90) and Carbon/E-Glass(0/90)+PA66 where 0/90 denote the fiber orientation 0° and 90° respectively. Carbon/E-Glass(0/90)+PA66 specimens consist of PA66 nonwoven fabrics which added into the laminates between reinforcement fabric. Tensile, Charpy impact, flexural and Mode I interlaminar fracture toughness (DCB) experiments were carried out in accordance with ASTM standards. Tensile test results showed that Carbon/E-Glass(0/90) specimens exhibit the higher tensile strength. In both hybrids configuration, the stiffer carbon fibers were parallel to the loading direction. When the PA66 veils were added between hybrid layers, Carbon/E-Glass(0/90)+PA66 tensile strength decreased about 23%. Charpy impact test results showed that Carbon/E-Glass(0/90)+PA66 specimens has the higher impact strength. When the PA66 veils were added between hybrid layers, Carbon/E-Glass(0/90)+PA66 impact strength increased about 8% as compared to Carbon/E-Glass(0/90). In both hybrids configuration, the E-glass fibers were parallel to the loading direction. If the ductile E-glass fibers were perpendicular to the loading direction, impact strength will increase. Flexural test results showed that Carbon/E-Glass(0/90) specimens had the higher flexural strength. When the PA66 veils were added between hybrid layers, Carbon/E-Glass(0/90)+PA66 flexural strength decreased about 40% as compared to Carbon/E-Glass(0/90). In order to determine the effects of fiber orientation on the flexural properties of the composites, Carbon/E-Glass(0/90)+PA66 were prepared in both 0° and 90° directions. For 0° direction, the carbon fibers were perpendicular to the loading direction while for 90° direction, the E-glass fibers were perpendicular to the loading direction. The load carrying capacity of the carbon fibers is lower than E-glass fibers in compression. Therefore, the specimens which were prepared in 0° direction had the lower flexural properties. Mode-I fracture toughness of Carbon/E-Glass(0/90) and Carbon/E-Glass(0/90)+PA66 were determined as 0.45 and 0.60 kJ/m². The improvement for the specimens containing the PA66 layers associates with fiber bridging observed during the crack propagation. Also, fibers were examined by Scanning Electron Microscopy (SEM). In conclusion, when the PA66 veils added, Mode-I fracture toughness and impact strength increase but tensile strength and flexural strength decreases. The results show that addition of the PA66 veils exhibit different mechanical properties in hybrid composite.

**Keywords:** Vacuum infusion, Hybrid composite, Mechanical properties, Carbon fiber, Glass fiber, Polyamide66 nonwoven fabric
ID 392

**Hydrogen storage in Expanded Perlite**

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Hydrogen storage can be an alternative way to eliminate the concerns about the fossil fuels. Recently, carbon and zeolite have been studied as hydrogen storage materials. Zeolite and expanded perlite have similar microporous characteristics. However, hydrogen storage capability of perlite is less studied. In our work, we aim to investigate the hydrogen storage capacity of expanded perlite.

**Keyword:** Expanded Perlite, Hydrogen adsorption

ID 395

**Silver Nanoparticles Supported On Clay For Cycloheene Oxydation**

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A monometallic catalyst based on silver supported on clay pillared by aluminum is prepared by deposition-precipitation method for testing in the cyclohexene oxydation reaction. These materials characterized by the DRX, BET and IR. In the following, these materials are tested in the cyclohexene oxidation reaction. The silver supported on aluminium pillared clay (Ag / Al-B) catalyst gives a high activity relative to the clay purified (Na-B) or aluminium pillared clay (Al-B).

**Keyword:** silver nanoparticles, clay, Deposition-Precipitation, Cyclohexene
Investigation of Liquid Transport in Micro and Nanoscale Porous Media at Different Pore to Throat Size Ratios
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Extensive usage of micro/nano-scale porous media in the various applications require a comprehensive understanding of fluid transport in those systems, such as in unconventional oil-reservoirs, micro/nano-membrane technologies, and lab-on-a-chip applications. The frequently employed transport calculations in literature don’t consider any effects related to size or shape of the confinement. Instead, dynamically similar flow systems assumed by the porosity of a given medium that an “ability of flow” definition named permeability is employed for a given solid/liquid couple based on porosity. However, in such small scales, liquid flow characteristics diverge from continuum behavior and non-equilibrium effects should be considered to estimate the transport. Furthermore, geometrical parameters of pore structures and networks should be considered, in addition to porosity, for a proper characterization. Hence, pore scale analyses of fluid flow were performed by solving Navier-Stokes equation numerically with finite element method in a representative elementary volume. Permeability values were calculated based on the Darcy’s Law, at different pore-to-throat-size ratios, porosities, and velocity slips whose range determined by a literature review. Permeability showed a strong dependence on pore-to-throat-size ratios, and slip conditions. Using the permeability of pores at a wide range of conditions, the Kozeny-Carman (KC) relation is re-considered. In addition to porosity consideration of KC, we attempted to further add geometrical-size and micro/nano-scale dependence by modeling Kozeny constant as a function of both pore-to-throat-size ratio and slip length. The pore-to-throat-size and slip effects were found substantial on transport, which was successfully predicted by KC-equation using in the Kozeny constant model developed.

Keywords: Velocity slip length, permeability, porosity, pore-to-throat size ratio, computational fluid dynamics

Electrokinetic Effects on Nano-scale Liquid Transport in Porous Media
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Liquid systems contain dissolved ions which interact with a charged surface and form the electrical double layer (EDL) as a result of electrokinetic interactions. EDL can be as thick as 300nm depending on ionic concentration in which fluid properties and dynamics diverge from the continuum descriptions. Understanding of electrokinetic effects on the liquid transport requires solution of ionic species distribution inside the EDL region. For such case, Poisson Boltzmann (PB) equation based theories are frequently employed in literature. However, applicability of PB is very limited since such solution is based on multiple assumptions which are not valid in many existing applications. In this paper, we will study solution of electric potential distribution by PB, and investigate its applicability limits. Then, we will use finite element solution of Poisson-Nernst-Plank (PNP) equation for high surface voltage and double layer overlap cases at different size micro/nano channels. We will further employ a multi-ion surface charge-regulation model in order to consider the variation of concentration on the surface as a function of the amount of EDL overlap. Calculated electrokinetic forces were coupled with the well-known Navier-Stokes equation in order to understand EDL effects on the micro/nano-scale liquid transport.

Keyword: Nano-channels, Silica, Surface Charge, Electroviscosity
Surface wetting is a very important phenomenon for various applications. It develops as a result of equilibrium in interfacial tensions on a surface and classically be quantified by the contact angle via Young’s equation. With the discovery of lotus effect, surface patterning became a promising tool for wetting control. Surface patterning is practiced by developing the desired set of structures on a surface using micro/nanomanufacturing techniques or laser ablation in order to design a specific wetting behavior. However, Young’s Equation is insufficient to explain the contact angle of a patterned surface while Wenzel and/or Cassie-Baxter models should be carefully applied. These models consider effects of roughness into wetting behavior and modify Young Equation. This talk discusses the mechanisms of these models, their applicability conditions and effects of surface roughness parameters to wetting behavior. We will further study them for micro/nano-scale wetting phenomenon. In micro/nano-scale, line tension can diverge wetting angles so at that small scales wetting angle measurements should be performed by considering additional effects. For such a case, molecular dynamics simulation of water nano-droplets on nano-patterned silica surfaces were performed in order to test existing theories.

The interactions between surfaces in electrolyte solutions is extremely important in numerous physico-chemical systems for a quantitative prediction. Homogeneity, dispersibility, rheology and forming characteristics of these systems depend solely on particles-particle interactions which in turn are determined by Van der Waals (vdW) and Electrical Double Layer (EDL) forces. The vdw forces are not affected by system chemistry. However, the EDL forces, which arise from the charging of on solid surfaces in a solvent, vary significantly with solution chemistry. So, manipulation of electrical forces is used widely in industrial applications to manipulate colloidal systems. Experimental in-situ measurements of these interactions are now possible with AFM down to sub-nanonewton levels. In this study, AFM was employed to estimate the surface charge or potential distribution of selected metal oxides using a silica colloid probe. The surface maps obtained show very good agreement with the average charge/potentials values from the literature and recent work. The work improves on a recent study (Yelken, 2010) which used commercial Si3N4 cantilevers to determine the charge distribution on quartz and sapphire surfaces by replacing Si3N4 cantilevers with custom-made colloid probes of desired material (quartz in this case) to probe the surface. The current work which improves the flexibility and resolution of the method was tested with two quartz and sapphire surfaces under different electrolytic conditions. AFM was employed to estimate the surface charge or potential distribution of selected metal oxides using a silica colloid probe. The surface maps obtained show very good agreement with the average charge/potentials values from the literature and recent work.

**Keyword:** Atomic force microscopy; Force curve; DLVO theory; Surface potential map
ID 402

**Design Of Chitosan Based Biofoams Using Micelles As Template**

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Biofoams are porous material which is bio-based alternatives made from a renewable feedstock. Porous foam biomaterials with homogeneous and ordered hole structure have been found to have numerous benefits when applied in research fields such as tissue engineering, drug delivery, catalyst support, separation, green packaging, and auto-motive components. Because of its superior properties, chitosan has been studied for use in a number of biomedical applications, including wound dressings, drug delivery systems, and space-filling implants. The major drawbacks of chitosan are still the lack of 1) proper mechanical strength for hard tissue engineering applications, 2) proper control of the foam pore architecture. Therefore several methods such as freeze-drying, gas templating, liquid templating and solid templating were suggested to manufacture chitosan foams with ordered structure. The aim of this study was synthesis of chitosan based ordered biofoams using physico-chemical routes. For this purpose, a new method that uses polymeric micelles as soft template materials was studied. The morphology of polymeric micelles was modified to adjust the size and shape of pore structure of chitosan films. A PEO/PPO/PEO type tri block copolymer, Pluronic P-123, P-103 and L-63 were used to form micelles in desired morphology. Then this polymeric phase removed from the structure using some solvents such as acetonitrile or ethanol to form foams. These structures were characterized by SEM, STEM, TEM and AFM.

**Keyword:** biofoam, micelle templated, chitosan, polymeric micelles

ID 404

**Toughness Improvement Of Carbon Fiber/Epoxy Composites By Polyamide-6,6 (Pa 66) Nonwoven Fabrics**

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Nonwoven fabrics are porous in nature and composed of randomly oriented microfibers. In this study, carbon fiber/epoxy composites were interleaved by PA 66 nonwoven fabrics to improve their delamination resistance against Mode-I loading. The morphological and thermal properties of the PA 66 nonwovens were investigated by scanning electron microscopy (SEM) and differential scanning calorimetry (DSC), respectively. Reference and PA66 nonwoven fabric interleaved specimens were manufactured by vacuum-infusion. Double cantilever beam (DCB) tests were performed on the prepared specimens. The glass transition temperature (Tg) of the specimens were determined by dynamic mechanical analysis (DMA). The average maximum force (Fmax) of the reference and PA66 nonwoven fabric interleaved specimens were determined as 83.5±3.0 N and 138.8±9.3 N respectively. The maximum force increased about 66% with the inclusion of PA66 nonwoven fabrics in the interlaminar region of CF/EP composites. The Mode-I fracture toughness of the reference and PA 66 nonwoven interleaved composite specimens were determined as 530.3 J/m2 and 1376.4 J/m2; respectively. The incorporation of PA 66 nonwovens led to significant increase in Mode-I fracture toughness about 160% due to the fiber bridging during the crack propagation. The Tg of all specimens was in the range between 85-86oC.

**Keyword:** thermoplastic interleaving, PA66 nonwovens, fracture toughness
Polypropylene (PP) is one of the widely used matrix material for composites due to their light weight, capability of manufacturing in complex geometries, heat distortion, electrical properties, fatigue strength, chemical stability and low cost. In order to improve the performance of PP several types of reinforcing materials or fillers have been used. Addition of short glass fibers (SGFs) can increase the strength and stiffness of unreinforced thermoplastics. In this study, effect of SGF content on the fatigue behavior of PP based composites was investigated. Extrusion compounding and injection molding techniques were used to prepare the SGF reinforced PP composites with 10, 20 and 30 wt. % fiber content. The composite specimens were subjected to the tensile test in order to determine the tensile strength of composites. Fatigue behavior of SGF reinforced PP composites was investigated at stress levels of 70, 80 and 90 %. Tensile properties of composites increased with increasing SGF content (about 258% higher than neat PP). However, fatigue life of composites decreased with increasing SGF content. Also to examine the failure modes of SGF reinforced PP composites, SEM analysis was employed after tensile and fatigue tests.

**Keyword:** Short Glass Fiber, Polypropylene, Fatigue Life

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Metal-oxygen batteries are one of the most popular battery systems in the recent years. These batteries are called next generation battery systems with more than 10 times of energy storage capacity they provide compared to lithium-ion batteries. The large energy storage capacity that metal-oxygen batteries promise is seen as an effective solution for the energy storage challenge for demanding applications like new-age consumer electronics, electric vehicles and large scale grid energy storage. Lithium-oxygen and sodium-oxygen batteries are the two popular types of metal-oxygen batteries, that were brought to the spotlight in the recent years. The performance of these battery systems depend heavily on the cathode material’s property, since the main electrochemical reactions take place in the porous cathodes employed in these systems. The porosity of the cathode is very important for the performance of these batteries as well as the choice of material and the use of nanocatalysts. The significance and main properties of metal-oxygen batteries will be discussed in this talk and the effect of cathode on the electrochemical reaction mechanisms will be overviewed in detail.

**Keywords:** Metal-oxygen batteries, Lithium-oxygen battery, Sodium-oxygen battery, Porous cathode materials
IIID 409

Influence Of Acid Treatment On Structural, Spectroscopic And Thermal Properties Of Chabazite

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Chabazite, of structural formula \((\text{Ca}0.5,\text{Na,K})4[\text{Al}4\text{Si}8\text{O}24]12\text{H}_2\text{O}\), is naturally occurring zeolite. In this study, chabazite obtained from Bala region from Turkey was crushed, ground and sieved to pass through a < 63µm sieve. Chabazite sample was modified by batch method using 100 ml of HCl solutions (0.1 and 1.0 M) at 90°C for 5h. The resulting acid-treated samples were named as 01H-CHA and 1H-CHA. The natural and acid treated chabazite samples were characterized by X-ray fluorescence (XRF), Fourier-transform infrared (FT-IR) spectroscopy, Thermogravimetric analysis (TG), Differential thermal analysis (DTA). The thermal behavior of the samples was investigated in the temperature range 30–1000°C with a linear heating rate of 10°C min⁻¹. X-ray diffraction patterns were recorded with a Bruker AXS powder diffractometer (D8 Advance) using CuKα radiation at 40 kV and 20 mA to scan over the 2θ range 3–40°. It was found that the total % mass losses of chabazite samples decreased as CHA > 01H-CHA > 1H-CHA. The structural changes upon the acid treatment were also verified with the result of XRF, XRD and FT-IR methods.

**Keywords:** Zeolite, Chabazite, XRF, XRD, FT-IR, TG/DTA

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IIID 410

Human eukaryotic HSP90 interferes with the bacterial GroEL mediated apoptosis in T cells

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Eukaryotic heat shock protein 90 (HSP90) regulates activity of many target proteins responsible for cellular growth, differentiation and apoptosis. The molecular basis of apoptosis regulation by HSPs are still under investigation. In this study, the effect of eukaryotic HSP90 was investigated on human T cell apoptosis induced by heat shock protein GroEL of Actinobacillus actinomycetemcomitans, which is an etiological agent of periodontal diseases. To do that, peripheral blood mononuclear cells (PBMCs) were isolated. HSP90 expression was induced by culturing cells 1 hour at 42°C and recovering 8h at 37°C. Heat shocked and control cells were incubated with different doses of recombinant A. actinomycetemcomitans GroEL protein (AaGroEL) at different time points. T cell apoptosis was measured by phosphatidylserine (PS) exposure, active caspase-3 and Bcl-2 detection by using flow cytometry. Results showed that upregulated heat shock response inhibits AaGroEL induced T cells apoptosis. The maintainance of antiapoptotic Bcl-2 expression and prevention of caspase-3 activation contributes to inhibition. Furthermore, mode of inhibition seems to involve the rescue of early apoptotic T cells (AnnexinV+/7AAD-). Overall data suggested that HSP90 hampers GroEL induced T cell apoptosis and the potential use of Hsp90 inhibitors in diseases where uncontrolled apoptosis frequently occurs. This work was supported by the Scientific and Technological Research Council of Turkey (TUBITAK) (Grant # 106T417 to Dr. Ayten Nalbant).

**Keyword:** Eukaryotic HSP90, T cells, Bacterial GroEL and Apoptosis
ID 411

**Biopolymer-assisted synthesis of cerium oxide nanoparticles**

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Cerium oxide is known for its antibacterial properties. In this work, cerium oxide nanopowder was prepared by using a single step biopolymer precursor method. This method is based on facile synthesis of cerium(III) alginate crosslinked gels. Ionic crosslinking of alginate polyelectrolytes with cerium(III) creates entrapped cerium(III) centers within the three dimensional alginate matrix. Applying heat to this matrix leads to the decomposition of alginate polymer chain and instant formation of nano sized cerium oxide particles. The product was characterized using X-ray diffraction (XRD), numerical grain size distribution analysis and other methods. The effect of annealing temperature on particle size and distribution was accordingly studied. The results were compared and discussed in detail with commercially available cerium oxide nanopowders.

**Keyword:** Cerium oxide, alginate, particles

ID 413

**Peg Modified Single-Walled Carbon Nanotubes: Molecular Dynamics Simulations And Experimental Approach**

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The fabrication of novel anti-cancer nanovector is often restricted by administration problems of drugs, such as low solubility, inefficient blood circulation time and the inability of drugs to cross cellular barriers. Owing to their unique physicochemical and biological properties, carbon nanotubes are spotlighted as one of the most promising nanomaterials for biological applications such as subcellular imaging and drug and gene delivery. In this study, we present an integrative approach to design biocompatible single walled carbon nanotubes (SWNTs) as nanovectors. We first employed molecular dynamics (MD) simulations to observe molecular interactions required for the integrity of the synthesized nanovectors, where system-level techniques remain inadequate. Subsequently, SWNTs were synthesized characterized, and were coated with PEG polymers. Biocompatibility of PEG/SWNT structures depends on their stability and effective PEG coating. Different SWNTs were modeled to reveal the effect of SWNT size on the interactions between PEG chains and SWNTs. The MD simulation and experiments results revealed that SWNTs should be well dispersed in the PEG solution for effective coating. Furthermore, a high molar percent of PEG chains with a lower molar percent of SWNTs should be used in the synthesis process in order to achieve a well-coated PEG/SWNT nanovectors.

**Keyword:** Single-walled carbon nanotubes, PEG coating, MD simulation, SWNT, Nanovector
How to Enhance Stability and Drug Reservation of Polymeric Micelles for Drug Delivery
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Polymeric micelles are potential carriers for the targeting delivery of water insoluble drugs. However, these systems lack the well-control of the release of the entrapped molecules. The success rates of these carriers are lower than desired due to the difficulties encountered in the effective transport and controlled release in the target organs. The main reason for this is the natural barriers the drug must overcome during the transfer of the drug; i.e. the interaction of the carrier with the other components of the blood plasma. For example, the serum albumin which can easily bind to other compounds in the blood has a plasma concentration between 35 to 50 grams per liter. Therefore, an interaction between the serum albumin and the micellar structures is quite likely, affecting their physical and chemical structures, hence, the drug holding, organ targeting and controlled release abilities. Therefore, several physical and chemical methods have been developed to improve micelle stability and drug reservation. In this critical review paper, all these methods (such as providing interactions between polymer molecules and drug) were discussed together to enlighten the stability problems of micelles and the drug reservation.

Keywords: micelle stability, polymeric micelle, drug delivery

Methanol Steam Reforming Over Silica Aerogel Catalyst For Hydrogen Production
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Hydrogen is a carbon free energy carrier but its purity is important for usage in fuel cells. While producing hydrogen, catalysts minimizing the undesired product formation are used to prevent any side products (like CO) that will damage the fuel cell. In this study, hydrogen was produced from Methanol Steam Reforming (MSR) reaction via silica aerogel catalyst. Silica aerogel was synthesized by sol-gel method in which TEOS was used as silica source, ETOH as solvent, TMCS as slylating agent and C6H14 as exchange liquid. Copper was loaded into silica framework (10%) by wet-impregnation and copper loaded catalysts were calcined under Air/Ar or N2 flow at 280, 450 and 700°C. Then, calcined catalysts were reduced under H2 flow and MSR took place in a tubular reactor, at 280°C. BET results of the non-reduced Cu loaded silica aerogels, which have Type IV isotherm, showed surface areas in the range of 535 to 799 m2/g and mean pore diameters from 4.5 to 9.6 nm. XRD results of the non-reduced catalysts revealed the presence of copper oxide in aerogel and an increase in the calcination temperature led to an increment in crystal size of CuO in these catalysts. ICP results showed 9.7 % to 11.5 % Cu in aerogels. Methanol conversion was nearly 100% for the synthesized catalyst and average mole fractions of H2, CO and CO2 were 71, 1 and 28% respectively with an average H2 yield of 82% for copper loaded silica aerogel catalyst calcined under Air/Ar flow at 700°C. Acknowledgements: Financial support of TÜBITAK 115 M 425 was gratefully acknowledged.

Keyword: methanol steam reforming, silica aerogel, hydrogen production
MOO3/TiO2-SiO2 And MOO3/ Ti-SBA-15 Catalysts For Production Of Epoxidized Soybean Oil
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Epoxidized soybean oil is produced by the oxidation of soybean oil by H2O2 in presence of an acid catalyst. It is used as raw material for fuel additives, polyol replacements, agricultural and pharmaceutical molecules, surfactants, adhesives, coatings. Homogeneous acids such as H2SO4 and HCl are used conventionally which have disadvantages such as difficult catalyst recovery and product purification, environmental problems and low selectivities. Thus, active, selective and reusable solid catalysts are needed for production of epoxidized soybean oil. In presented study, TiO2-SiO2 (TS), Ti-SBA-15 (TSB), MoO3/TiO2-SiO2 (MTS) and MoO3/ Ti-SBA-15 (MTSB) catalysts were prepared and tested in epoxidation of soybean oil with H2O2 in ethyl acetate solvent at 80 °C. Catalyst characterization results are given in Table 1. TiO2-SiO2 had the highest total acidity however it had only weak acid sites. Ti-SBA-15 had weak, moderate and strong acid sites. MoO3 loading enhanced both total acidity and acid strength of Ti-SBA-15 and improved the activity. MoO3/Ti-SBA-15 gave 83% conversion with epoxide product which had high acidity and high surface area. The studies are in progress. * This study was founded by IZTECH as BAP project with project number of 2015-İYTE-03. [1] K. Saremi, T. Tabarsab, A. Shakeri, Annals of Biological Research, 3, (2012), 4254 – 4258. [2] A. Campanella, M. A. Baltanás, M. C. Capel-Sánchez, Green Chemistry, 6, (2004), 330 – 334. [3] M.D. Serio, R. Turco, P. Pernice, Catalysis Today, 192, (2012), 112 – 116.

Keyword: heterogeneous catalysts, mesoporous catalyst, epoxidation, epoxidized soybean oil

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In this study, the activated carbon was prepared from chestnut shell by chemical activation with H3PO4 as activating agent at 500 oC and 3/1 impregnation ratio. Prepared activated carbon was used to remove Methylene Blue from aqueous solutions. The surface area and total pore volume of chemically modified activated carbon were 2046 m2/g and 0.98 cm3/g; respectively. The effects of various process parameters such as; pH, contact time, temperature, initial methylene blue concentration and the amounts of adsorbent dosage on the adsorption capacity of the activated carbon were investigated. Isotherm studies were carried out and the data were analyzed by Langmuir and Freundlich equations. The experimental data indicated that the adsorption isotherms are well described by the Langmuir equilibrium isotherm equation. Pseudo-first order and pseudo-second order kinetic models were used to find out the kinetic parameters and mechanism of adsorption process. According to these results, prepared activated carbon could be used as a low-cost adsorbent to compare with the commercial activated carbon for the removal textile dyes from wastewater.

Keywords: chestnut shell, activated carbon, methylene blue, adsorption
Carbon Molecular Sieves (CMS) are a kind of activated carbon (AC) with a very well defined microporosity and a uniform micropore size distribution which confers selectivity toward the adsorption of gas molecules with different molecular sizes. Any carbonaceous material with low inorganic compounds can be used as a raw material for CMS preparation. In this study, Carbon Molecular Sieves were produced from chestnut shell by chemical activation process followed by chemical vapor deposition (CVD) of methane. The influences of deposition temperature (800-900 oC), time (15-60 min), and flow rate of CH4 (100-300 ml/min) on pore development of carbon molecular sieve were investigated. Produced CMSs were characterized by several techniques such as, N2 adsorption, CO2 adsorption, CH4 adsorption, FTIR, SEM and elemental analysis. The textural analysis of the CMS samples showed the successful deposition of methane on pores of chestnut shell derived activated carbon to yield a microporous CMS with a narrow pore size distribution. The deposition temperature, time and flow rate of CH4 have been shown to strongly affect the pore structure of the CMS. Maximum CO2 adsorption capacity (525.7 mg/g) was obtained at a deposition temperature of 850 °C, time of 30 min, and CH4 flow rate of 100 mL/min.

Keywords: Carbon molecular sieve; Chemical vapor deposition; Activated carbon; Methane

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Glyceryl Oleate Synthesis Over W & Zr Loaded Mesoporous Catalysts

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Due to the decrease in fossil fuel resources biodiesel production have increased as an alternative fuel recently. During the production of biodiesel, glycerol is the main by-product which can be valuable in many sectors such as food, cosmetics, oil and drug industries. Glycerol esterification with fatty acids yields mono-, di- and triglycerides. Monoglycerides have good surfactant properties and been applied in different areas including food industry, cosmetics, pharmaceutical formulations and detergents. Industrial production is performed with homogeneous acid catalysts, which cause environmental problems, high purification costs and low selectivity. Heterogeneous acid catalysts are investigated to overcome these problems. Co-precipitated WO3-ZrO2 (15 and 20 wt% WO3, WZ15 and WZ20 respectively) and Zr incorporated SBA-15 catalysts (Zr-SBA-15) were tested for glyceryl oleates synthesis in this study. The catalysts were characterized by XRD, Raman, BET, NH3-TPD and FTIR. The results were also compared with H3PO4 as homogeneous acid catalyst. Although the conversion obtained with H3PO4 was higher compared to heterogeneous catalysts, selectivity to monoglycerides was very low (33.3 %). The highest monooleate yield was obtained over Zr-SBA-15 which was the catalyst with the highest surface area and high amount of Brønsted acid sites (Table 1). Table 1 Resulting conversions, selectivities and monoester Catalyst OA Conversion (%) MG Selectivity (%) DG Selectivity (%) TG Selectivity (%) MG Yield (%) no catalyst 3.4 30.0 40.0 30.0 50.0 H3PO4 97.7 33.3 44.4 22.2 52.6 Zr-SBA-15 71.4 52.7 29.1 18.2 69.6 WZ15 65.1 54.1 30.1 15.8 63.2 WZ20 61.7 67.1 29.8 13.1 60.2 [1] V.N. Mutlu, S. Yilmaz, Applied Catalysis A:General, 522, (2016) 194-200 [2] S. Ramu, N. Lingaiah, B.L.A.P. Devi, R.B.N. Prasad, Applied Catalysis A: General, 276 (2004)163–168.

Keywords: heterogeneous catalysts, glyceryl oleate, mesoporous catalysts
ID 422

Chitosan/Na-Carboxymethyl Cellulose Based Porous Scaffolds for Bone Regeneration
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Organic-inorganic composites are the new generation of high-performance biomaterials by taking the advantages of inorganic materials (e.g. rigidity and high stability) with the advantages of organic polymers such as flexibility, ductility, and processability in bone tissue engineering applications. In recent studies, it is revealed that the composites consisting biopolymers and silica particles show potential in biomedical applications. Diatom frustules, the mineralized exoskeleton of Diatomaceous earth, consists of mainly silica mineral with unique architecture and porosity. Therefore, the main objective of this study is to develop diatomite incorporated chitosan/Na-carboxymethyl cellulose porous scaffolds for tissue engineering applications and to determine the effect of diatomite on the physical, mechanical and biological characteristics of the polymer. The scaffolds were prepared with freeze-drying technique to obtain a microporous structure required for vascularization. The characterization of scaffolds was done with protein adsorption, degradation, swelling studies and mechanical analysis. The morphology and the cell attachment on scaffold surface were observed with SEM analysis. In vitro cell culture studies performed with MG-63 cell line was done to observe the effect of diatom incorporation on cell behavior and proliferation. Results indicated that diatomite incorporation increased the swelling ratio of the composite scaffolds due to its hydrophilic nature. Diatomite containing scaffolds did not show any cytotoxic effect on MG-63 osteosarcoma and SW1353 chondrosarcoma cell lines. Besides, diatomite incorporation enhanced the biomineralization on scaffold surface which is an important step for bone regeneration.

Keyword: diatomite, scaffold, bone tissue

ID 423

Use Of Seed Particles To Understand The Nucleation And Growth Processes During Stober Synthesis
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The need for nano-sized silica particles with well-defined size and shape has been growing steadily in high end applications. The size distribution of these particles depend strongly on the respective concentrations of TEOS, ammonia, water and ethanol, the feed rate of TEOS, mixing conditions and other reaction conditions such as temperature. Also, seed-growth method will be used to achieve desired size distribution.

In this study, silica production by Stöber method was carried out while seeding the system with particles of known characteristics. The size distribution of the particles were determined with scanning electron microscopy coupled to an image analysis software. The presence of seed particles as nucleation sites did not prevent the formation of new nucleation sites and created multi-model size distributions depending on the feed rate of silica source addition. The increase in the feed rate increased the number of models in size distribution. The control of size distribution seems to be affected only by the addition type (the feed rate) of silica source not by the available surface area.

Keyword: Silica, seeded growth, size distribution
Synthesis of Ni-Co/Al2O3 Catalyst for Hydrogen Rich Gas by Biomass Gasification
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Throughout history, the energy has been the most important necessity for people. From the past to present, energy resources which are fossil-sourced harmful to the environment has been used that’s why some problems arose such as global warming. However, fossil resources are dying out rapidly. Because of these reasons, the necessities of renewable and sustainable energy resources are increasing continuously. Hydrogen is renewable and sustainable, non-emission and the most suitable energy carrier for the environment. Using as energy resources for hydrogen production has not become widespread because of its high cost. With this purpose biomass is being used for the catalytic gasification.

In this study, Ni-Co/Al2O3 catalysts were synthesized by impregnation method and characterized by XRD, XRF, SEM, BET and TGA techniques. The activity of catalysts was determined by performing gasification of biomass. Different gasification parameters such as temperature (450, 650, 850°C), reaction time (10, 15, 20 min), catalyst ratio (0, 10, 20, 30, 40, 60% by weight) were used in order to find out suitable reaction condition with the highest hydrogen content of product gas.

Keywords: Biomass, Gasification, Updraft gasifier, Hydrogen, Catalyst, Co-precipitation, Ni-Co/Al2O3

Hydrogen Generation By Hydrolysis of Sodium Borohydride On Co-B/ Magnesite Catalyst
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Nowadays, the increasing of energy demand has become a serious issue with the fast economic development around world. Hydrogen is considered to be an efficient energy carrier for the future due to increasing demand of energy along with depletion of conventional fossil fuel reserves. Sodium borohydride (NaBH4) is a suitable hydrogen source due to its advantages of high hydrogen density (10.8 %) and stability in alkaline solution. Hydrogen can be generated through the hydrolysis of NaBH4 by using a suitable catalyst. Metal boride catalysts received considerable attention due to their high efficiency, low cost and simple preparation methods. In this study, Co-B catalyst was synthesized on the magnesite by impregnation using cobalt (II) chloride solution and then was reducted by sodium borohydride solution. The hydrogen generation activity of Co-B/magnesite catalyst was tested through hydrolysis of sodium borohydride alkaline solution. Effects of catalyst amount, NaBH4 concentration and reaction temperature on hydrogen generation rate were investigated. The hydrogen generation rate was obtained as 29000 mL/min gCoB at 50°C. The kinetics of catalytic hydrolysis reaction was also examined. The reaction kinetics obeyed the zeroth order kinetic model. The activation energy of hydrolysis reaction was estimated be 68.56 kJ / mol.

References

Keywords: hydrogen generation, sodium borohydride, Co-B/magnesite catalyst, catalytic
Thermal energy storage (TES) systems provide efficiency in order to have better utilization of energy sources while protecting the environment. Thermal energy storage can be classified as sensible and latent heat storage. The storage of latent heat allows a greater density of energy storage with a narrow temperature range during phase change. Phase Change Materials (PCMs) are important novel materials, which are used as the storage of thermal energy as latent heat, and can provide utilization of waste heat energy. In this study, the capric acid and oleic acid mixture containing hexadecane were encapsulated as the core with styrene-divinylbenzene copolymer shell by emulsion polymerization technique. Thermal properties of fatty acid micro capsules were characterized by Differential scanning calorimetry (DSC) and also their morphology and structure were investigated by Fourier transform infrared spectroscopy (FT-IR) and Scanning electron microscopy (SEM). The microencapsulated PCM was prepared successfully, and results of the analysis presented that this material is promising candidate for potential heating and cooling system applications.

Keywords: Energy, Phase Change Materials, Encapsulation, Thermal Energy Storage

Energy usage is increasing day by day due to rapid developing technology and increasing population, and this leads the needs enhanced. Due to these increasing demands, the need for efficient use of the resources is emerging. A substantial amount of the supplied energy is provided by the limited amount of fossil energy resources. Therefore, thermal energy storage is being an option for energy savings and to lower the energy requirements. Phase Change Materials (PCMs) can be used for thermal energy storage in many applications. During in a process, the temperature of these materials kept constant and absorbed energy is used for the phase change. While the absorbed energy is stored and used later whenever is required. The aim of this work is to develop novel encapsulated PCM prepared by emulsion polymerization method composed of n-octadecane and n-hexadecane mixture as the core and poly(styrene-co-divinylbenzene) as the shell. The morphology of microencapsulated PCM was characterized by Scanning electron microscopy (SEM). The thermal properties and structure analysis were investigated by Differential scanning calorimetry (DSC) and Fourier transform infrared spectroscopy (FT-IR), respectively. The prepared microencapsulated PCM can be used as a reference material in the future works for thermal energy storage in various heating and cooling energy systems.

Keywords: Thermal Energy Storage, Energy Savings, Phase Change Materials, Eutectic
ID 430

**Effects of Demineralisation Process on the Activated Carbon Prepared from Rawdon Coal**

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Coal has been used for energy production in many countries since at the beginning of industrial revolution. Besides coal is a raw material of advanced materials such as activated carbon, carbon fiber, carbon molecular sieves and graphite. In recent years, coal based activated carbons have been used in the supercapacitor applications for reason of their promising properties including high surface area and microporosity. The content of mineral matter of coal is significant in supercapacitor applications and does affect supercapacitor performance. The amount of mineral matter in the coal directly influences the surface area and porosity of the activated carbon. Present study focused on the effects of demineralization process on the activated carbon prepared from Rawdon coal. The activated carbons were produced from the raw and demineralized coals at different carbonization and activation temperatures. The solids (the coal and activated carbon samples) were characterized in terms of elemental, gas adsorption (surface area and pore size distribution) and FTIR analysis techniques. The results clearly showed that demineralization process has important effects on the properties of activated carbons.

**Keywords:** Activated carbon, Coal, Demineralisation, Porosity, Surface Area

ID 433

**Modified Nanoporous Alumina Membranes for Sensitive and Reproducible SERS Substrates**

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Despite the potential sensitivity and the wide range of applications for surface-enhanced Raman spectroscopy (SERS), it is not used as a routine detection tool due mainly to the poor reproducibility of the enhanced SERS signals. In order to obtain reproducibly strong SERS data, both lithographic and non-lithographic approaches are intensively investigated to produce large-area nanopatterned SERS substrates displaying periodically arranged arrays of nanostructures. Herein, we report a facile method for the non-lithographic fabrication of plasmonic nanoparticle arrays by utilizing the barrier sides of anodized aluminum oxide (AAO) membranes. The nanobump-decorated surfaces (NBDS) of AAO barrier sides were treated with wet etching to create periodic arrays of nanocraters. Upon coating with an optimized thickness of Au, the nanocrater decorated surfaces (NCDS) displayed intensified SERS signals compared with the NBDS counterparts. This result was also confirmed with simulation studies and it was related to the increased surface roughness for the NCDS substrates. The fabricated Au@NCDS nanoplatofrms were stable for extended periods and allowed enhanced and reproducible SERS signals with relative standard deviation values ~ 10 % from independently prepared samples. Our current studies are focused on the potential use of these SERS substrates for sensing biomarker molecules including myoglobin and troponin-T.

**Keywords:** SERS, AAO Membranes, Nanocrater Arrays, Reproducibility
The Use of Conducting Nanoporous Membranes for Modulating Nerve Cell Behavior
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Nanoporous anodized alumina membranes (AAMs) have numerous biomedical applications spanning from biosensors to controlled drug delivery and implant coatings. Although successful attempts are present for AAM as an alternative bone implant surface, its potential as neural implant coating remains to be demonstrated. Herein, we introduce conductive and nerve growth factor (NGF)-releasing AAM substrates that not only can provide the native nanoporous morphology for cell adhesion but also can induce neural differentiation. We have recently reported the fabrication of such conductive membranes by coating AAMs with a thin C layer. In this work, we investigated the influence of electrical stimulus, surface topography and chemistry on cell adhesion, neurite extension and density by using PC 12 pheochromocytoma cells in a custom-made glass microwell setup. The conductive AAMs showed enhanced neurite extension and generation with electrical stimulus but cell adhesion on these substrates were poorer compared to the naked AAMs. The latter nanoporous material presents chemical and topographical features for superior neuronal cell adhesion, but more importantly, when loaded with NGF, it can provide neurite extension similar to an electrically-stimulated CAAM counterpart. This project was supported by The Scientific and Technological Research Council of Turkey, Grant No: 111M686.

**Keyword:** AAO Membranes, PC 12 Cells, Topography, Stimulation

The Research of Effect of Juniperus Excelsa Bieb. Fruits on Angiotensin Converting Enzyme Purified by From Human Plasma
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Angiotensin converting enzyme responsible from regulation of blood pressure was purified and characterized from human plasma by affinity chromatography. The enzyme purified 3659 fold with a specific activity of 1350 EU/mg protein from human plasma. The purity of ACE was determined by SDS-PAGE and seen two bands 60 kDa and 70 kDa on the gel. Effect of ethyl acetate, butanol and water extracts of Juniperus excelsa Bieb. fruits on purified ACE activity investigated. Lisinopril used as reference inhibitor. Ethyl acetate extract of Juniperus excelsa Bieb. fruits showed activation effect on human plasma ACE activity. Butanol and water extracts of Juniperus excelsa Bieb. fruits showed inhibition effect on ACE activity. Activity% versus Activator graph for ethyl acetate extract of Juniperus excelsa Bieb. fruits and Activity% versus Inhibitor graphs for butanol and water extracts of Juniperus excelsa Bieb. fruits, and lisinopril were drawn. IC50 values for butanol and water extracts of Juniperus excelsa Bieb. fruits was found as 2.858 mg/mL and 5.790 mg/mL respectively. Type of inhibition for all inhibitors from graph Lineweaver-Burk was determined to be reversible noncompetitive inhibition. IC50 value and Ki constant for lisinopril calculated as 7.81x10-4 µM and 6.618x10-4 µM respectively.

**Keywords:** Angiotensin converting enzyme, inhibition, activation, Juniperus excelsa Bieb., lisinopril.
Effect of Oxide and Reduced Glutathione on Angiotensin Converting Enzyme Purified By From Human Plasma
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Angiotensin converting enzyme was purified from human plasma by affinity chromatography. The enzyme purified 5367 fold with a specific activity of 1208 EU/mg protein from human plasma. The purity of ACE was determined by SDS-PAGE and seen two bands 60 kDa and 70 kDa on the gel. Effect of oxide and reduced glutathione on purified ACE activity investigated. Lisinopril used as reference inhibitor. Oxide glutathione showed activation effect on ACE activity while reduced glutathione showed inhibition effect. Activity% versus Activator graph for oxide glutathione and Activity% versus Inhibitor graphs for reduced glutathione and lisinopril were drawn. IC50 values for reduced glutathione and lisinopril was found as 1.62x10-2 mM and 7.81x10-4 µM respectively. Type of inhibition for reduced glutathione and lisinopril from graph Lineweaver-Burk was determined to be reversible noncompetitive inhibition. Ki constants for reduced glutathione and lisinopril calculated as 1.17x10-2 mM and 6.618x10-4 µM respectively.
Keyword: Angiotensin converting enzyme, oxide and reduced glutathione, inhibition, activation, lisinopril.

Investigation of Structural Part Production by Powder Metallurgy Method for Hypereutectic Al-Si Alloy
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Hypereutectic Al-Si alloys are very promising material due to their excellent properties, including low coefficient of thermal expansion, low density, good corrosion resistance and high wear resistance. Therefore, conventional PM technology come to the fore to provide expected technological properties with relatively low manufacturing cost for the structural parts by cold pressing and sintering approach. The aim of this study is to investigate the structural part production by powder metallurgy process.
In this study, hypereutectic Al-20Si-6Cu alloy powder is produced in our laboratory. The cleaned powder is cold pressed under 700 MPa pressure by single action press. The most suitable sintering temperature and time is determined by examining the hardness and microstructure of the parts for various parameters. The 550 °C and 50 minutes is found as the most suitable sintering temperature and time, respectively. The solution heat treatment is applied at 530 °C with duration of 50 min. The artificial ageing is applied for a long time. The experimental results are given and discussed for the mechanical properties of the parts.
Keywords: Hypereutectic Al-Si alloy, Powder Metallurgy, Sintering
Determining the Diffusion Coefficients of n-Heptane–Composite Powders by IGC
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Heptane is a non-polar solvent and generally used in manufacturing adhesives, paints and coatings, cleaning and degreasing, and as a minor part of gasoline. Heptane is preferred to hexane because of being less volatile and hazardous. Organic solvents are the main causes of air pollutions. Increasing environmental awareness brought with it strict clean air laws. Accordingly determining the mass-transfer properties of organic solvents by easy, accurate and reliable methods became a necessity. As a matter of fact, inverse gas chromatography (IGC) gave an opportunity to examine the mass-transfer properties. In this study, polymer composites were prepared by solution blending in order to use as construction materials. Then the adsorption characteristics and the diffusion coefficients of n-heptane–polymer composite powders were examined by IGC. The diffusion coefficients of n-heptane–polymer composite powders were found around 5-9.10^{-10} \, cm^2/s. The effects of the composite structures to the diffusion coefficients were also discussed. IGC is a fast and a cheap alternative method for determining the diffusion coefficients when the presence of small amount of solvent and slow diffusion cases.

Keyword: Diffusion coefficient, Inverse gas chromatography, Composite characterization

The Effect of Silica Sources on Surface Morphology of Porous Chitosan Scaffolds for Tissue Engineering Applications
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In recent years, various nanoparticles are available with defined size and shape enables researchers to design favorable polymer nanocomposites for bone tissue regeneration, showing enhanced mechanical and surface properties compared to polymeric materials. Silica, hydrated silicon dioxide, the second most abundant biogenic mineral is produced by various plants and animals. In this study, two different silica sources, diatomite and polyhedral oligomeric silsesquioxanes (POSS) were used. Effects of silica type and loading on the mechanical, morphological, surface properties and wettability were investigated by using SEM, AFM, contact angle analysis, swelling, protein adsorption study. The porosity of scaffolds was analyzed by micro-CT and mercury porosimeter in a range of 82-90%. Wet chitosan-silica composite scaffolds exhibited higher compression moduli compared to pure chitosan scaffold. Average pore size ranges of chitosan-diatomite and chitosan-POSS composite scaffolds were obtained as 150-180\,\mu m and 220-300\,\mu m, respectively. AFM images presented different surface topographies and enhanced surface roughness with diatomite and POSS incorporation. The pore size and pore surface area differences obtained with increasing silica content affected water uptake capacity of scaffolds positively. The composite scaffolds prepared in the present study with tunable surface and morphological properties can be considered as a potential candidate for bone tissue engineering applications.

Keyword: Diatomite, POSS, bone tissue, silica, porous scaffold
In this study; removal of Chromium (VI) from aqueous solution by adsorption onto agricultural waste (modified sunflower head waste) was investigated. Batch studies were conducted and effect of initial solution pH, initial concentration, adsorbent dosage, temperature, and contact time on the removal of Cr(VI) was investigated. Cr(VI) was determined by UV spectrophotometer. The maximum removal was obtained at the initial pH of 1 for initial concentration 150 mg/L, at 25 °C and 240 rpm. Adsorption yield was increased with the increasing adsorbent dosage and temperature. Langmuir and Freundlich isotherm models were applied to data. Pseudo first order and pseudo second order kinetic models were applied to fit kinetic data. Thermodynamics parameters were also determined. The positive values of ΔH° change indicated that adsorption is endothermic. Negative values of ΔG° showed adsorption process is spontaneous. The positive ΔS° values indicated that the randomness increase. Adsorbent capacity was obtained as 7.35 mg/g.

REFERENCES

Keywords: Adsorption, Chromium (VI), Sunflower table

One of the most important sources of pollution for the earth and groundwater on industrial and agricultural scale is nitroaromatic compounds. Nitroaromatic compounds are widely used in many processes including dyes, medicines, pigments, insecticides, wood preservatives and the production of rubber chemicals. Aminophenols, which are reduction products of nitrophenols, are known to be widely used as intermediates for the synthesis of pesticides, drugs, dyes and other chemicals due to their low toxicity.

In this work, we report a facile synthesis of Pd nanoparticles supported on different materials such as SiO2, Al2O3, C and graphene oxide (GO) and their superb catalysis for the reduction of various nitrophenols including 2-nitrophenol, 4-nitrophenol, 2,4-dinitrophenol and 2,4,6-trinitrophenol in aqueous sodium borohydride solution. Pd based nanocatalysts were simply and reproducibly prepared through wet-chemical deposition and reduction technique and characterized by ICP-OES, P-XRD, XPS, TEM and TEM/EDX analyzes.

Acknowledgements
This work was supported by the Research Fund of Yüzüncü Yıl University (Project ID: FBA-2017-6070).

Keywords: Nanoparticles, nitrophenols, catalysis, reduction
Hydrogen energy has been evaluated to be an ideal energy source because of its zero carbon emission and high heat of combustion compared with traditional fossil fuels in recent years. Today, the safe and efficient storage of hydrogen is one of the most important and challenging problems in the hydrogen based energy policies. There are numerous solid hydrogen storage materials for chemical storage of hydrogen. One of which is dimethylamine-borane ((CH₃)₂NHBH₃, DMAB). DMAB is appropriate materials due to their high efficiency of H₂ production, high stability, and nontoxicity. Their price is much lower than other B-N compounds such as ammonia-borane. Hydrolytic dehydrogenation of DMAB produces 3 mol of H₂ per mole by using 2 mol of water. In this work, we report a facile synthesis of multi-walled carbon nanotubes (MWCNT) supported Rh(0) nanoparticles (Rh@MWCNT) and its catalytic activity for the hydrolytic dehydrogenation of DMAB. Rh@MWCNT nanocatalyst were simply and reproducibly prepared through wet-chemical deposition and reduction technique and characterized by ICP-OES, P-XRD, XPS, TEM and TEM/EDX analyzes. In addition, detailed kinetic studies on the catalytic reaction were performed to determine the activation parameters.

**Keyword:** Nanoparticles, dimethylamine-borane, catalysis, hydrolytic dehydrogenation, rhodium

Hydrogen is defined as an alternative energy source that does not generate any pollution from the environment when pure hydrogen is burned in a fuel cell. The main challenges in hydrogen-powered energy systems are the storage and transport of hydrogen. To deposit of hydrogen, sundry effective hydrogen storage materials have been developed by scientists. Among these materials used for hydrogen storage, boron-nitrogen (B-N) containing compounds are of great interest both because of their high mass density of hydrogen and their stability and non-toxicity. Methylamine-borane (CH₃NH₂-BH₃, MeAB), an important B-N compound, is an ammonia-borane derivative and it has been studied in hydrolysis reactions over the past years due to massive hydrogen density of 11.1%. Hydrolytic dehydrogenation of MeAB, 3 moles of hydrogen can be obtained per mole MeAB in the presence of a suitable catalyst. In this work, we report a facile synthesis of zirconia nanopowder (nano-ZrO₂) supported Rh(0) nanoparticles (Rh/nano-ZrO₂) and its catalytic activity for the methanolysis of MeAB. Rh/nano-ZrO₂ nanocatalyst were simply and reproducibly prepared through wet-chemical deposition and reduction technique and characterized by ICP-OES, P-XRD, XPS, TEM and TEM/EDX analyzes. In addition, detailed kinetic studies on the catalytic reaction were performed to determine the activation energy, activation enthalpy and activation entropy.

**Keyword:** Methanolysis, methylamine-borane, catalysis, Rh nanocatalyst, zirconia
ID 449

Synthesis and definition of ceria-supported ruthenium nanoparticles for hydrolysis and methanolysis reactions of hydrazine-borane

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One of the most important sources of pollution for the earth and The efficient and safe storage and release of hydrogen is the major technical challenge of utilizing hydrogen as an alternative energy carrier. Especially, boron- and nitrogen- (B-N) based compounds such as hydrazine borane (N2H4BH3, HB) have received much attention. In general, hydrogen stored in HB can be released through solvolysis (hydrolysis and methanolysis) in solution presence of a suitable catalyst. Herein, for the first time nano-CeO2 supported Ru nanoparticles (Ru/nano-ZrO2) were synthesized and characterized. The catalytic performance of this nanoparticles in the hydrolysis and methanolysis of HB has been examined. Ru/nano-ZrO2 nanoparticles were simply and reproducibly prepared through wet-chemical deposition and reduction technique and characterized by FT-IR, UV-Vis, ICP-OES, P-XRD, XPS, TEM and TEM/EDX analyzes. Moreover, the effect of catalyst and HB concentrations and temperature on the catalytic reaction was also investigated.

Keywords: Hydrolysis, methanolysis, hydrazine-borane, catalysis, ruthenium, ceria

ID 455

Development Of Composite Structures With Extrusion Or Lamination Technologies For Automotive Industry

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Due to high demands on enviromental rules on CO2 emission, decreasing of fossil fuels the lightweight studies are very important for all industries besides in automotive. A lot of studies can be made on lightweight of automotive parts. The composites are very important in lightweight applications. The composite have two or more different materials that combined together to create a superior and unique material. The composites can provide below properties according to ingredients of composites; Lightweight High strength Corrosion resistant High strength-to-weight ratio High impact strength Non-magnetic Low maintenance Long-term durability,... The composites are generally 4 folds lighter than steel, 1,5 folds lighter than Aluminium. In recent years the carbon fiber reinforcement is gained importance. In order to develop lightweight structure some development studies are carried out by extrusion or lamination process. Different materials (polymer, foil, fabric, felt, carbon fiber, ...) are extruded or laminated to use as a internal part of automotive and later the tests are made according to automotive standards (thermal and mechanical behaviour). The obtained test results are compared with related standards' acceptable values. And than the prototype will be prepared and applied on real product. According to the obtained results, final composites structured will be determined.

Keyword: Composites, automotive, lightweight
Preparation and Characterization of Poly(lactic acid) and Essential Oils Based Antimicrobial Food Packaging Materials
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The development of bio-based antimicrobial packaging materials has attracted great interest in the food packaging. Poly(lactic acid) PLA is a versatile and biodegradable thermoplastic material which can be obtained from renewable sources. Epidemiological studies have shown that the number of pathogenic food-borne diseases is significantly increased. Therefore, to control pathogens; reduce foodborne diseases and provide safe, healthy and nutritious food to consumers. Biodegradable polymer films have become important in order to develop functional properties such as active compounds, mechanical and antimicrobial properties by using essential oils. The addition of plant essential oil into the PLA film have been increased the industrial applications of PLA. Active antimicrobial packaging films protect the food against chemical, physical and microbiological effects. PLA can easily be produced biotechnologically from natural renewable sources such as starch, corn, whey, sugar cane and sugar beet. The antimicrobial or other biological activity of essential oils is directly related to the presence of bioactive volatile components. In this study, the preparation of blend films of PLA/essential oil (bergamot, lemon grass, rosemary and carnation essential oil) has been described as an examination of the effect of the resulting essential oil species on the mechanical, thermally, biodegradability and antimicrobial properties of the resulting PLA-based blend films in the literature.

Keywords: Poly(lactic acid), antimicrobial, packaging, essential oils, characterization

SilverContaining Pyrrole and Chitosan Copolymers
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This study presents synthesis of block copolymers of chitosan (Cs) and polypyrrole (PPy) with silver nanoparticles via redox polymerization in aqueous media with magnetic stirrer system in presence of ammonium cerium (IV) nitrate (Ce+4) at room temperature. Copolymers of chitosan and polypyrrole (Cs-b-PPy) were synthesized by chemical oxidative polymerization using Ce+4 as an oxidant. During this reaction, silver nitrate (AgNO3) solution was added in order to increase its conductivity and to give the copolymer anti-microbial property. The synthesized block copolymers (Cs-b-PPy) with silver nanoparticles were characterized by spectroscopic analysis and the electrical conductivities were investigated with 4-point probe technique. The obtained samples were also characterized morphologically by Scanning Electron Microscope (SEM). Nanocomposites of conducting polymers and metallic nanoparticles have attracted considerable attention in recent years because of their potential applications in various areas, such as electrocatalysis, chemical sensors and optoelectronic devices[1-3]. They have synergistic chemical and physical properties based on the constituent polymer and introduced metal. Extraordinary physicochemical properties of such nanocomposites can be attributed to high surface area and quantum size effect [4]. Various methods for the preparation of these composites have been described. In general, these following routes are used: (a) where the monomer or polymer acts as a reductant for the metal, yielding the nanocomposite in powder or thin film forms or (b) preparation of the nanoparticles followed by either chemical polymerization around the particles or dispersion of the nanoparticles in a polymer matrix [5]. Noble metals, such as silver, gold, platinum, or palladium, are highly resistant to oxidation and corrosion even at high temperatures. Especially as nanoparticles in the combination with conducting polymers, they produce attractive materials for various applications in electronics, sensors, catalysis, and medicine. Among conducting polymers, polypyrrole (PPy) is of interest due to its environmental stability, redox properties, and ease of synthesis. The high electrical conductivity of composites is usually the primary target [6]. In this work, Chitosan / Polypyrrole/ Ag (Cs-b-PPy/ Ag) nanocomposites were synthesized with pyrrole and chitosan via redox polymerization in aqueous media with magnetic stirrer system in presence of ammonium cerium (IV) nitrate (Ce+4) at room temperature. The roles of the morphology of the resulting products were investigated. Chitosan/ Polypyrrole/AgNO3 Nanocomposites (Cs-b-PPy/ AgNO3) were prepared with the oxidant to pyrrole molar ratio 0.67:1 showed conductivities 7.5 x 10-1 S/cm. The oxidant to pyrrole molar ratio 0.67 is proposed to be the optimum stoichiometry for the better conductivity while the ratio for the highest yield was obtained for molar ratio of 1.0. The obtained results showed that ESEM micrograph for the surface of Chitosan/Polypyrrole/ Clay Nanocomposite has average size of 29.8 nm.
Zeolites can be used in several industrial applications such as drying processes, water treatment and energy recovery and storage systems as adsorbent, ion exchanger or catalysis. Although zeolites have high affinity to various gases and vapor, water vapor has a special value since the pre-adsorbed water affects the zeolite applications quietly. However, the studies on adsorption of water on zeolites is limited and the researches on heat and mass transfer properties of this pair is not sufficient. In this study, water vapor adsorption of zeolite 13X and 4A was discussed. Adsorption capacity and effective mass diffusivity was determined by using a volumetric system. The experiments were performed for the regeneration temperature of 90°C and adsorption temperature of 35°C. It was seen that while adsorption capacity was reached to 25 (%kg/kg) for zeolite 13X at approximately 3000 Pa, the capacity of zeolite 4A-water pair was 14 (%kg/kg) at the same pressure. Additionally, the effective diffusivity of water vapor was smaller for zeolite 4A than zeolite 13X.

**Keyword:** Adsorption, Zeolite, Water vapor, Mass Diffusivity

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Laser-Induced Breakdown Spectroscopy, LIBS, has grown in the past few decades as a promising technique that finds applications in a variety of fields including: environmental, geochemical, archeological, industrial, pharmaceutical and biological (1-2). Although, the dynamics of the laser-induced plasma are strongly dependent on the type and the pressure of the background gas, studies that address these issues are relatively less.

In this study, a low-pressure LIBS system has been designed and constructed for the determination of phosphorous in proteins, specifically in casein and ovalbumin. Protein samples in both pelletized form and in SDS-gel matrices, were subjected to energetic laser pulses from a Nd:YAG laser (SpectraPhysics, 10 ns, 532 nm) for plasma formation. Plasma emission is collected by suitable optics and analyzed by ICCD detector. Experimental conditions, like: laser pulse energy, detector delay time, detector gate time, type of the background gas and pressure were optimized to maximize the P(I) signal at 253.5 nm and 255.3 nm.

Results indicate tenfold enhancement in signal intensity of the P(I), under argon atmosphere at tens of a millitorr pressures, compared to the ones at atmospheric air pressures. Technique is capable to detect nanogram amounts of phosphorous in protein samples.

References:

**Keywords:** Laser-Induced Breakdown Spectroscopy, proteins, SDS-gel
Copper acetate $[\text{Cu}_2(\text{O}_2\text{CCH}_3)_4]\cdot2\text{H}_2\text{O}$ is a famous copper(II) compound with a lantern- or paddle-wheel-like dinuclear core and has attracted much attention for a long period because of the unique structure and properties. There are so many analogous compounds with a lantern-like core as dinuclear metal carboxylates. Previously, we reported that copper(II) benzoate forms a chain compound with pyrazine and the assembled compound has a gas-occlusion property for N$_2$. We found that the aromacity of the benzoate group plays an important role to construct a hydrophobic micropore. In order to understand the adsorption properties of these compounds, systematic investigations are needed for various types of metal carboxylates. In this study, we synthesized a series of copper(II) trimethoxybenzoates substituted with methoxy group at the three positions of the benzoate group in order to give variety to these compounds. The isolated compounds were characterized using elemental analysis and infrared and UV-vis spectra and temperature dependence of magnetic susceptibility. Crystal structure was determined by the single-crystal X-ray diffraction method for copper(II) 2,3,4-trimethoxybenzoate. Gas-adsorption behavior was investigated for N$_2$. We will discuss on the adsorption property based on the crystal structure.

**Keyword:** Binuclear Complex, Adsorption Property, Crystal Structure, Magnetic Property

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In the 21st century, the substantial increase in heavy metal contamination in nature is one of the most serious problems humankind confronts with and this problem continues to rise with industrialization. So many industrial water bodies are polluted heavily with both organic and inorganic contaminants such as heavy metals and dyes discharged into them. Since heavy metals are non-biodegradable and cause irreversible damage to nature and habitat. It is crucial to tackle this problem and to remove heavy metals from them. Adsorption is a simple but effective method to remove these metals. In this work, Diospyros Kaki leaves were used as biosorbent for the removal of heavy metal ion Ni (II). Adsorption, to be more precise, biosorption experiments were carried out at different pH levels. The effect of biomass dosage, contact time and initial concentrations on the removal of Ni (II) from the industrial waste water were also investigated. Different isotherm models such as Langmuir and Freundlich isotherm models were used to clarify the adsorption mechanism. The experimental results obtained cast hopeful light on disposing of heavy metals.

**Keywords:** Diospyros Kaki, Heavy metal, Waste management
The Synthesis Of Micro-Porous Activated Carbon From Rice Husk By Chemical Activation And Optimizaton Of Experimental Paramaters

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To produce low-cost highly porous carbon has great significance for the development of industrial processes. The most direct route for producing carbon is to employ agricultural wastes and residues. As an agricultural waste, rice husk is abundantly present in the world. However, the utilization of rice husk is limited to forage and fodder in Turkey. In this study, activated carbons based on agricultural waste i.e. rice husk were produced by wet chemical method using an activating agent HNO3 at different temperatures and acid/raw material ratios. The morphological, chemical and structural properties of 12 different activated carbons produced were thoroughly characterized by Brunauer-Emmett-Teller (BET) Surface Analysis, Fourier Transform Infrared Spectroscopy (FTIR), Elemental (CHNO) Analysis, Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD). The results indicated that the production of highly porous carbons from rice husk is dependent highly on experimental parameters.

Keywords: Porous activated carbon, Agricultural waste, Characterization

Hierarchial Pore Structure Of Activated Carbon From Bovine Bone By Microwave Irradiation

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According to the EU Commission Decision 94/381/EC, the feed of livestock with meat and bone has been forbidden. Therefore, a high amount of bovine bone has to be disposed of or transformed into valuable by-products. For this purpose, in this study highly porous biochars were manufactured from bovine bones through microwave-assisted activation. The obtained biochars were characterized by nitrogen adsorption-desorption, scanning electron microscopy, and Fourier Transform Infrared spectroscopy. Also, the effects of the experimental variables, such as microwave irradiation power, impregnation time and temperature, on the morphological and structural properties of the biochars were optimized by Response Surface Methodology (RSM). Variance analysis (ANOVA) of the produced biochars shows that all the experimental variables used in the production of micro-meso porous carbons had a considerable effect on pore surface area and volume. This effect was correlated successfully by nonlinear interacted quadratic model.

Keywords: Bovine, Porous powder, RSM optimization
In this study, the removal of Cu (II) heavy metal ions in industrial waste water was examined using a natural agricultural waste. As a biosorbent, Canola waste was used as an adsorbent. Different pHs, initial concentrations, and temperatures were selected as experimental variables. The amount of the removal of Cu (II) from the waste water was calculated using UV-Vis Spectroscopy. All the variables used in the study were optimized by Variance Analysis (ANOVA). The experimental parameters were found to be in good harmony with theoretical calculations using ANOVA. The most important variables which influenced the removal of the heavy metal ion turned out to be initial concentration, and biosorbent amount using F and P tests. The obtained results of this study indicate that copper could be removed through a simple and eco-friendly adsorption process using a cost-effective biosorbent from and agricultural waste i.e. canola which exists abundantly in Turkey.

**Keywords:** Waste management, Adsorption, Copper

As a result of the developing technology, the construction industry has also gone to a great interest to discover new materials. A lot of literature research has been done for the lightweight aggregates used in the construction industry. In this study different types of lightweight aggregates are used for porous lightweight concrete production. For this reason, 8-15 mm pumice and expanded perlite were obtained from Ankara region, 4-8 mm pumice was supplied from Manisa Salihli, volcanic tuff aggregate was obtained from Antalya and expanded clay was supplied from Holland. Before lightweight concrete production aggregates were separated into adequate particle classes by sieve analysis in diameter with 4-8 mm, 8-11.2 mm and 11.2-15 mm. The expanded clay had a size of 0-4 mm and was separated into 0-1 mm and 1-4 mm sizes. The fresh concrete properties are determined by slump and flow table tests. Hardened composite properties are evaluated by unit weight, ultrasound pulse velocity and compressive strength tests on 15x15x15 cm cubic specimens. According to test results structural lightweight concrete can be produced with those aggregates. Expanded clay and perlite reduced the workability of the fresh concrete. Volcanic tuff and pumice provided to reach compressive strength values over 25 MP.

**Keywords:** Lightweight concrete, Pumice, Volcanic tuff, Expanded perlite, Expanded clay
Simulation Of Co-Cured Multi-Cell Composite Box Beam Manufacturing Via Vartm

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Sub-structures of aircraft structures mainly consist of stiffened shells such as fuselage frames, ribs and multi-cell box beams. Conventionally, these stiffened shells are manufactured through a process wherein shells and stiffeners are fabricated separately and then are integrated either through mechanical fastening and adhesive bonding. Co-curing is an integral molding technique that can greatly reduce the part count and the final assembly costs for composite materials. This article presents a simulation of integral manufacturing of a three-cell composite box beam by vacuum assisted resin infusion process. To validate the model, the characterization tests of both resin and reinforcement materials were carried out. Porosity and permeability testing of the reinforcement materials were conducted. Moreover, the effect of stacking sequence and vacuum level on the preform porosity were investigated. Additionally, the resin viscosity measurements were performed and the influence of temperature and curing on resin viscosity were examined. Having obtained the characterization data, vacuum infusion model was validated using RTMWorx software and then simulation of a three-cell composite box beam was conducted.

Keywords: Resin Flow Modeling, Simulation, Co-curing, Multi-cell Composite Box Beam, Vacuum Assisted Resin Infusion

Properties Of Concrete Pavements Produced With Different Type Of Fibers

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Researches demonstrate that fibers boost performance of concrete incredibly. It’s determined that in literature steel fibers increase flexural strength and energy absorption capacity of the cementitious composites. However concrete highways consist of steel fibers in corrosive conditions eliminate fiber’s effect. Therefore producers of polymer fibers launch fibers can withstand corrosive environments and chemicals, and launch polyester and polypropylene fibers alternative to steel fibers.

This research intends to determine the performance of concretes consist of polyester fiber, polypropylene fiber and steel fiber against traditional concrete. For this reason fresh and hardened concrete properties of the concrete mixtures produced with 0%, 1% and 2% are determined by laboratory tests. The mechanical behaviors of these concrete specimens are investigated by compressive strength and tensile strength tests on 150x150x150 mm cubic and 100x100x500 mm prismatic specimens respectively. The abrasion resistance of the pavement concrete is measured by Bohme abrasion test on 70x70x70 mm cubic specimens. Test results showed that fibers are reinforced concrete against external effects which can be occurred during the service life of the rigid pavements. Significant developments are determined with the polymer fiber additives on concrete abrasion resistance and mechanical behavior of concrete.

Keywords: Pavement, Steel fiber, Polyester fiber, Polypropylene fiber, Abrasion resistance
**Characterization of Nuclear Concretes: Effect of thermal stress up to 1000°C**

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An experimental study is carried out to characterize the alteration of siliceous (SC) and the sandlime (SLC) concretes under thermal stress. The microstructure, porosity, mass loss and specific surface area of both concretes are investigated in a temperature domain ranging from room temperature up to 1000 °C. The study of the thermal degradation of cement paste, aggregates and concretes was carried out using the thermo-gravimetric analysis. Mercury Intrusion Porosimetry was further applied to access to their porous structure. Samples consist in either monoliths or disaggregated concretes. When compared to SC, SLC samples show greater mass losses when exposed to temperatures higher than 700°C since much more gas would be produced from the decomposition process of calcium carbonate into quicklime and carbon dioxide. Moreover, their porosity turns out to be twice larger than that of SC. SC and SLC are representative of French nuclear power plants. This work is therefore expected to bring new insights in the damages induced in their structure when in contact with molten metallic materials. This problem is actually of first importance for the understanding of the last phase of nuclear reactor accidents.

**Keyword:** Concreto - Sandlime - Siliceous - High temperatures - porosity - mass loss - Interface

**Use Of Novel Sorbents As Preconcentration Materials For The Determination Of Mercury**

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Determination of mercury is of great environmental importance. Mercury and its compounds are considered to be pollutants of priority interest by the Environmental Protection Agency of the United States (USEPA). According to USEPA maximum contaminant level (MCL) is 2 μg L–1 for drinking water. Also, the upper limit for total mercury concentration in drinking water recommended by the European Community (EC) is 1 μg L–1. In this study, applicability of poly(acryl amide) grafted onto cross–linked poly (4–vinyl pyridine) (P4–VP–g–PAm) and nano zero-valent nickel (nZVNi) have been investigated for the preconcentration of mercury species (Hg(II) and MeHg(I)) using cold vapor atomic fluorescence spectrometry (CV–AFS). Batch type sorption experiments were performed and the effects of pH, sorbent amount, contact time and sample volume were investigated on the sorption of mercury species. Selectivity studies were also carried out with several competitor ions namely Pb(II), Zn(II), Cu(II), Cd(II) and Fe(III). Finally, these sorbents were used successful for application to mercury determination in sea, estuarine and tap water. The overall results have demonstrated that the proposed sorbents are promising candidates for the removal of mercury species from aqueous solutions.

**Keyword:** mercury; preconcentration; removal; cold vapor atomic fluorescence spectrometry
Electrochemical Stability of Vitamin B2 Self-Assembled Monolayer Films on Copper

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Electrochemical stability of organic films on metals is very important for their practical applications in corrosion protection, electrocatalysis and sensor applications. In the corrosion protection applications, most of organic films losses their protection efficiencies as a function of exposure time. Therefore, we have studied electrochemical stability of self-assembled monolayers of vitamin B2 (VB2-SAM) modified copper samples in 3.5% NaCl solution which is one of the most common and aggressive corrosive media. The SAM films were prepared on copper samples from ethanol solution containing 0.1 mM VB2 for 24 h exposure. Their electrochemical stability was evaluated using cyclic voltammetry and chronoamperometry techniques. It was shown that VB2-SAM-modified copper has high electrochemical stability in the test solution.

Acknowledgements
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Keywords: Copper, Self-Assembled Monolayer, Vitamin B2, Electrochemical Stability

Stability of Microbubbles under Ultrasound
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Microbubbles are stable micron sized particles filled with gas inside and surrounded by phospholipids on their shells. Microbubbles have been used as ultrasound contrast agents in ultrasonography. Stability of lipid-based microbubbles (MBs) were investigated under ultrasound. The amplitude and attenuation values were measured with respect to MB concentration and found that there are nearly linear dependencies in a certain range of MB concentration. Lower frequencies were found to be sensitive to lower MB concentrations. The scattering properties of ultrasound waves were studied and shown that the effect of ultrasound on the MBs was similar. Stirring of MBs at different RPM values did not affect the stability of microbubbles. It was shown that ultrasound affected the microbubble stability, decreasing their concentration faster at higher frequencies.

Acknowledgements
This work was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) through the project number of 113M270.

Keywords: ultrasound, microbubble, contrast agent, particle
**Stability of Microgugububbles under Ultrasound**

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Microbubbles, as ultrasound contrast agents used in ultrasonography, are stable micron sized particles filled with gas inside and surrounded by phospholipids on their shells. The effect of ultrasound power on the stability and oscillations of microbubbles were investigated. It was found that the microbubbles showed an elastic oscillation at powers less than 50% of full power, and the microbubbles started to lose their stability as the power was increased. The microbubbles were almost stable at lower power modes losing their B-mode brightness intensities to almost 80% at 20 seconds and totally lost their B-mode intensities at 20 seconds at full power. It was concluded that the microbubbles are stable at lower power inputs which were satisfactory enough for a certain time during in-vivo investigations.

Acknowledgements
This work was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) through the project number of 113M270.

**Keywords:** ultrasound, stability, microbubbles, ultrasound, particle

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**Design and Synthesis of Nano Drug Delivery Vehicles**

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Liposomes are useful carriers for in-vivo targeted delivery of pharmaceutical agents. A wide variety of methods are available for preparation and loading of liposomes as well as characterization and targeting. We have developed liposomes loaded with different solutions and tested for their release rates. Liposomes were prepared from various buffers such as calcium hydroxide, combined sodium hydroxide/phosphoric acid, and sodium carbonate. Sodium hydroxide based buffer have caused liposome instability. Sodium carbonate solution resulted in stable liposomes. Size and zeta potential values were measured by DLS. It has been found that the liposomes were 192 nm in diameter, which proves that they were suitable for medical usage from size perspective. Zeta potential of liposomes was found to be -6.33 mV, which proved that they form relatively stable colloids. The release rate studies indicated that liposomes permeated the uncharged form of CO2 and acidified the external environment where they stayed in.

Acknowledgements
This work was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) through the project number of 113M270.

**Keywords:** liposome, drug delivery, cancer
ID 483

Analysis and Application of a Hybrid Linearization Approach for Flow in Porous Media
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Boussinesq’s equation simulates the behavior of flow in porous media and is suitable for water level calculation in unconfined aquifers. In this study, we develop a hybrid linearization method with combining Fréchet derivatives and various space discretizations. The linearization technique is mainly based on the procedure converting the nonlinear equation into a set of linear algebraic equation, iteratively. Additionally, we prove the convergence of the hybrid method using the concepts of the consistency, stability and the rate of convergence. Several numerical examples are exhibited and the obtained results are compared with the available experimental and numerical data found in the literature.

Keywords: Flow in Porous Media, Numerical Simulation

ID 487

Synthesis of Methyl Oleate Epoxides over WO3-ZrO2 and TiO2-SiO2 Mixed Oxide Catalysts
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As the fossil fuels diminishing, the interest in the development of renewable alternative sources for the synthesis of chemicals and fuels increased. One of these alternative sources is the epoxidized fatty acid esters. Epoxidized fatty acid esters are key raw materials used for many commercial applications, as plasticizers and stabilizers, as additives in lubricants, as components in thermosetting plastics and in cosmetics and pharmaceutical formulations [1]. Although, homogeneous peracid process is applied to produce epoxidized fatty acid esters commercially, it is known that this process has disadvantage such as environmental problems and expensive product purification process. Thus, it is preferred to carry out these epoxidation reactions by heterogeneous catalysts instead of homogeneous catalysts. In this work, methyl oleate was synthesized by esterification of methanol and oleic acid using sulfuric acid as catalyst and then it was epoxidized with hydrogen peroxide over SO4/TiO2-SiO2 and WO3-ZrO2 catalysts in ethyl acetate at 80 oC. TiO2-SiO2 catalyst was prepared by sol-gel and sulphated while WO3-ZrO2 was prepared by co-precipitation method. Detailed characterization of the catalysts was performed by BET, XRD and NH3-TPD methods. Characterization studies showed that surface area and pore size of SO4/TiO2-SiO2 was much higher than WO3-ZrO2. Both catalysts have high acidities, while WO3-ZrO2 possessed medium strength acid sites, SO4/TiO2-SiO2 had peaks at both weak and strong acid sites. The catalytic activity tests showed that methyl oleate conversion obtained over SO4/TiO2-SiO2 (35%) was higher than WO3-ZrO2 (24%). When the results obtained over two catalysts were compared, it can be said that the acidity of the catalyst is important for the activity. The studies are in progress.

Table 1. Catalyst Characterization and Reaction Results

<table>
<thead>
<tr>
<th>Pore Size (Å)</th>
<th>Pore Volume (cm³/g)</th>
<th>Surface Area (m²/g)</th>
<th>Conversion of Methyl Oleate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO4/TiO2-SiO2</td>
<td>48.0</td>
<td>0.27</td>
<td>337.5</td>
</tr>
<tr>
<td>WO3-ZrO2</td>
<td>31.9</td>
<td>0.06</td>
<td>81.3</td>
</tr>
</tbody>
</table>

References

Keywords: Epoxidized fatty acid ester, methyl oleate epoxide, mixed oxide catalyst
ID 488

Modification of Commercial Boron Caride Powders with Rapid Carbothermal Reduction

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Rapid carbothermal reduction (RCR) is a novel method for synthesizing submicron boron carbide powders with low free carbon and high twin density. Commercial boron carbide powders were processed through the RCR furnace to eliminate free carbon and change particle morphology. These powders were characterized and compared to starting material. Analyses revealed that free carbon was reduced to trace amount, powder morphology was changed and particle size was slightly increased. Commercial powders and modified powders were sintered using spark plasma sintering (SPS) at different temperatures and dwell times to compare sintering behavior. Sintering behaviors and microhardness results were improved with modified boron carbide powders.

Keywords: Boron Carbide, Synthesis, SPS

ID 489

Polymeric Composite Based Radar Absorbing Structures for Structural and Wideband Electromagnetic Wave Absorbing Applications

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Radar Absorbing Materials, RAM, radar absorbing structures, reinforced composites, epoxy matrix, thin film, carbonyl iron powder

"A radar absorbing structure capable of absorbing electromagnetic (EM) waves in addition to its structural functionality is a high demand in critical applications. Fiber reinforced polymeric composites containing special fillers within the structure have great potential for radar wave absorbance. In this study, radar absorbing structures based on several special structures such as Dallenbach layer, Salisbury screen and Jaumann absorbers were designed and manufactured from polymeric composites. Glass fiber / epoxy systems were prepared as a base structure and carbonyl iron based powders were used as filler for electromagnetic wave absorber in epoxy matrix. In Salisbury screens and Jaumann absorbers, resistive sheets were used to increase the bandwidth of absorbance. Glass fabric surfaces were coated with thin layer of metallic conductor with surface resistances up to 1000 to act as a resistive layer within the composite structure. Coatings were prepared by a large scale magnetron sputtering unit. Fabricated composite structures achieved 12 dB reflection loss for the thickness of 2.65 to 3.15 mm and the resonant frequency was detected as 7 GHz.

Keywords: Radar Absorbing Materials, RAM, radar absorbing structures, reinforced composites, epoxy matrix, thin film, carbonyl iron powder
Capabilities of single wall carbon nanotubes (SWCNTs) are well documented, but historically their applications have been limited, mainly because of the absence of commercially viable technology to enable large-scale production of SWCNTs as well as the lack of effective methods for introducing nanotubes into materials' matrices. In 2013, OCSiAl launched Graphetron 1.0, the world's only industrial facility to synthesise SWCNTs. The company also launched TUBALL™, which contains more than 80% SWCNTs and can be used as a versatile additive for a range of diverse materials. Unlike conventional additives such as multi-wall carbon nanotubes, carbon fibers and most types of carbon black, TUBALL™ provides significant improvements in various properties of most materials upon the addition of just 0.01%–0.1% by weight. Well-dispersed TUBALL™ nanotubes create a 3D reinforced and conductive network, with minimal impact on the original colour or other key properties of the augmented material.

To facilitate the effective incorporation of TUBALL™ into materials, OCSiAl has developed a line of easy-to-use pre-dispersed concentrates, masterbatches and suspensions that are compatible with a wide variety of industry-standard formulations. Success stories on energy storage, elastomers, paints & coatings, resins & composites indicate numerous innovation spaces yet to be charted and possibilities to leap beyond the previously-unattainable.

Doxorubicin (DOX) is one of the anticancer agents used in chemotherapy. Using DOX in free form affects not only cancer cells but also the healthy cells. Therefore, use of liposomal doxorubicin in cancer treatment is preferred over the free doxorubicin to reduce the side effects associated with the free form of the drug. Finding optimal liposome compositions for liposomal drug delivery is however of special importance for their effective use since the establishment of correct balance between efficacy and toxicity is usually one of the major obstacle in successful drug delivery. Here, we aimed to investigate the effect of cholesterol on doxorubicin loading into and release from liposomes composed of mainly gel-phase lipids, namely DSPC, and lipopolymers. Cholesterol content on the liposomes was varied from 0% to 50% and DOX at different concentrations were loaded into the liposomes by active drug loading method. At high drug loadings, drug-to-lipid ratio exhibited a dramatic increase with increasing cholesterol content in the liposome bilayer. But, at lower drug loadings, this ratio increased with cholesterol content up to about 30 %, but a point was reached beyond which additional cholesterol had an almost insignificant effect. The liposomes with varying cholesterol content exhibited slightly higher drug release behaviors in PBS than in PBS containing BSA at physiological concentration at 37 °C, reaching a plateau in less than 30 minutes in both medium. In all formulations, release % was less than 10 %. Serum stability of these liposomes indicated that these liposomes are potential to reduce the systemic concentration of the drug in the bloodstream. These gel-phase liposomes can be used eligibly as drug delivery vehicles via attachment to microbubbles providing ultrasound assisted delivery.

Acknowledgement: This study was supported by a grant from The Scientific and Technological Research Council of Turkey (project no 213M668).

Keywords: Doxorubicin, liposome, cancer
Optimization of Textile Dye onto Diatomite

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Various experimental design methods are widely used in various fields including science, social and educational sciences. The use of orthogonal arrays in fractional factorial designs are efficient. For this purpose, in this study, the adsorption performance of diatomite for Maxilon Yellow 4GL as a model basic dye from aqueous solution was optimized using Taguchi experimental design methodology. L27 (34) orthogonal array was used to optimize the dye adsorption by the diatomite. The selected factors and their levels were dye concentration, dosage of adsorbent, solution pH, and temperature. The predicted dye adsorption capacity for diatomite from Taguchi design was obtained as 0.084 mmol g-1 under optimized adsorption conditions. The diatomite (D), Maxilon Yellow 4GL (MY) and Maxilon Yellow 4GL adsorbed diatomite (MY-D) were characterized by SEM, FTIR-ATR, TGA and BET surface area analysis.

Keywords: Optimization; adsorption; dye; diatomite; characterization

Synergistic effect of antimony trioxide nanoparticles on the structural, thermal and flame retardant properties of polypropylene

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Halogen-free nanoparticles are widely used for flame retardant mechanism. Huntite and hydromagnesite mixture provides flame retardant properties at high reinforcing rates in polypropylene (PP) composites. PP composites were produced through twin screw extruder. The flammability and thermal degradation properties of PP composites containing huntite and hydromagnesite nano powders were characterized. A synergistic effect in thermal and flame retardancy were observed when antimony trioxide nano powders was used in combination with huntite and hydromagnesite. The structural analysis of the powders was performed by X Ray Diffraction (XRD) method. The surface morphology and particle size distribution of the nanoparticles were identified using scanning electron microscopy (SEM), and dynamic light scattering (DLS) techniques. The thermal and flame retardant properties of PP composite were evaluated using DTA-TG and UL-94 measurements.

Keywords: Flame retardancy; Polymer nanocomposite; Polypropylene; Thermal stability; Synergistic effect
Hydrogen Adsorption on Acid Treated Mordenite
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Mordenite is one of the high silica natural zeolites. It has two types of hollow channels. The ellipsoidal 12-membered ring channel with an aperture of 7.0 × 6.5 Å and 8-membered ring channel with an aperture of 5.7 × 2.6 Å run parallel to the c axis. These channels are interconnected via perpendicular compressed 8-membered channel (3.4 × 4.8 Å), in the form of small side pockets parallel to the b axis. In this study, a mordenite-rich tuff (M) from the Şile region (NW Turkey) was treated with HNO3 and H2SO4 at various concentrations (1.0, 3.0 and 5.0 M) at 80 oC for 3 h. Mordenite-rich sample and that of acid modified forms were characterized by XRF and N2 adsorption techniques. The chemical analyses of mordenite samples were carried out using a Panalytical-Zetium model XRF instrument. Micropore area, micropore volume, total pore volume and average pore diameter values were calculated using the N2 adsorption data. H2 adsorption capacities of the natural and acid treated mordenites were obtained volumetrically with Autosorb-1C equipment at 77 K up to 100 kPa. Before the nitrogen and hydrogen adsorption experiments, all the samples were degassed in vacuum at 300 oC for 12 h.

Keywords: mordenite; XRF; N2; H2; adsorption

Development and Characterization of Tribaloy T-400 Cladding by Microwave Energy Technique
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Tribaloy is well known as laves phases alloy and its coatings/claddings generally more suitable for turbine applications, due to its good tribological and corrosion properties. In the present work, the cladding of hard cobalt based powder on the pure titanium substrate through a newly developed microwave energy technique. By using a domestic microwave oven at frequency 2.45 GHz and 900 W of power with a duration of 2100 s clads were developed. Prior to microwave cladding, High energy ball milling was carried out in order to achieve intermetallic phases in tribaloy T-400 powder. The microstructure and mechanical properties of tribaloy T-400 developed clads are investigated through scanning electron microscope (SEM), X-ray diffraction (XRD), and Vickers microhardness. The results exhibits developed clads is distributed uniformly and crack free interface also revealing good metallurgical bonding with higher microhardness of the clad

Keywords: Microwave cladding, High energy ball milling, Tribaloy, Intermetallic phases
Setting Times, Shrinkage and Compressive Strength of Slag Cement Activated by Mineral Activator

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The aim of this investigation is to study the effect of mineral activator (hydrated lime) on the setting times and shrinkage of slag cement (latent hydraulicity). The activation of slag cement by the mineral activator accelerates the hydration process and reduces the setting times of the cement activated. The results indicated that the setting times (initial and final) decrease proportionally with the increase of the percentage of lime of cement activated by the mineral activator (hydrated lime). The drying shrinkage increase according to the variation of the percentage of the mineral activator (hydrated lime). The experimental results indicated that the mineral activator has a significant effect on the compressive strengths.

Keywords: Setting times; Shrinkage; compressive strength; mineral activator; slag cement.

Synthesis and Luminescence Properties of Thulium(Iii) Doped and Thulium(Iii) /Neodymium(Iii) Codoped Yttrium Silicate Nanophosphors

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We have investigated the upconversion luminescence properties of yttrium silicate (Y2O3: SiO2) nano powders doped with different concentrations (0.5%, 1% and 0.25 % per mole) of Thulium (III) (Tm3+) and codoped with Thulium (III) (Tm3+) and Neodymium(III)(Nd3+) rare earths. The samples were synthesized by using the sol gel method and powder forms were obtained by annealing them at 12500C during 12 h. Luminescence properties of single doped and codoped samples were investigated at room temperature and pressure. The emissions due to the energy transfers of appropriate dopants were observed when the samples were excited by the 808 nm light from a diode laser.

Keywords: Thulium(III), Neodymium(III), sol gel, luminescence, upconversion
ID 286
Influence of the Nature and Particle Size Distribution of Rolled and Crushed Coarse Aggregates on the Physico-Mechanical Properties of High-Performance Concrete
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The improvement of the qualities of a high-performance concrete is a constant concern of the researchers, the introduction of fillers such as pouzzolanes, the introduction of additives such as super plasticizers, contributed to the improvement of BHP, other parameters also influence the performance of these BHPs, the quality of the aggregates and the class of cements used. In order to improve the porosity of the granular skeleton, and to improve the rheology of our BHP, 3/8 fraction rolled gravel with smooth and rounded surfaces was introduced, in substitution for the crushed gravel, by testing various combinations of rolled gravel fractions 3/8 and 8/15 crushed, the combination 40% rolled gravel 3/8 and 60% crushed gravel 8/15 gives a minimal porosity. These rolled gravels will facilitate the rearrangement of the grains in the granular skeleton, thus reducing the porosity of our BHP and contributing to its durability. Also the introduction of different percentages of pouzzolane finely ground with a Blaine surface of 4500 cm$^2$ / g, and a fixed percentage of super plasticizer 1.5% by weight of cement, as determined by saturation tests. The use of a cement CEM II 52.5 mpa, allows an improvement in the compressive strength of 35.1% and a decrease of 9.16% for the tensile strength relative to the control concrete.

Keywords: High-Performance concrete, pouzzolane, rolled gravel, porosity, strength.

ID 290
Effect of Crushed Glass and Plastic Fibers on the Physical and Mechanical Properties of Mortar
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This study aims the recycling and recovery of glass waste in the form of aggregates of dimensions 0 / 3mm from a light crushing followed by screening (sieving)) by replacing a portion of quarry sand containing a large amount of fine, which results in an increase in the mixing water that negatively affects the mechanical strength of the mortar, and plastic waste in the form of ribbons 5 mm wide, of different lengths as an addition in order to reinforce and improve the flexural strength of the mortar. The study is a characterization of materials used to formulate mortars based on glass debris and plastic ribbons. In this sense, we studied a series of tests, varying the rate of substitution of glass debris (5, 10, 15, 20, and 25%) and the incorporation of plastic tapes of lengths (5, 10) cm. A comparison of the results with a control mortar without addition is established.

Keywords: Recycling, environment, waste glass, plastic ribbons, quarry sand, mortar
Performance of TPA Incorporated Cu–Zn based Catalysts in Dimethyl Ether and Methanol Synthesis from Syngas

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Dimethyl ether (DME) and methanol have attracted a great attention of researchers due to their clean and environmentally friendly fuel properties. In this study, synthesis of methanol and direct synthesis of DME from syngas were investigated by using the Cu–Zn based and tungstophosphoric acid (TPA) incorporated bi-functional catalysts. Cu/ZnO/Al2O3 catalysts containing different molar ratios of Cu/Zn were prepared by co-precipitation method. Higher surface area values were observed at higher Cu/Zn ratios. Surface area of the catalyst containing a Cu/Zn ratio of 3 was found to be 60 m²/g. Activity test of the catalyst in methanol synthesis was carried out at 5.0 MPa and 275 oC. The methanol selectivity decreased as the Cu/Zn molar ratio decreased, and the maximum selectivity of 87% was achieved with a catalyst containing a Cu/Zn molar ratio of 3. Furthermore, DME was synthesized following a direct synthesis route by using bi-functional catalysts, which were composed of TPA incorporated Cu–Zn based catalysts. Quite high DME selectivity value (about 53%) was obtained by using TPA impregnated Cu/Zn catalyst containing a molar Cu/Zn ratio of 3. Results showed that DME selectivity decreased with decreasing Cu/Zn ratio. Moreover, results of synthesized catalysts were compared with the results obtained using commercial HifuelR-120 catalyst. DME selectivity of the synthesized bi-functional catalyst was close to the results obtained with the commercial catalyst.


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Keywords: TPA, Dimethyl ether, Methanol

Oxidation Behaviour of NiAl-Cr(Mo) Eutectic Alloy Produced By Electric Current Sintering

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In this study, we characterized NiAl-Cr(Mo) eutectic alloy produced by electric current sintering in open air under an uniaxial pressure of 500 MPa at 3500-4500A for 40 minutes using Ni (99.8% purity and 4-7 µm size), Al (99% purity and 15 µm size), Cr (99.8% purity and 1-5 µm size) and Mo (99.95% purity and 3-7 µm size) powders. The relative density and porosity of the synthesized sample were measured using Archimedes’ method. The microstructures and phase constitutions were characterized by scanning electron microscopy (SEM-EDS), X-ray diffraction (XRD). Microhardness of sintered test materials was determined by using micro- hardness tester with a load of 500 gr for 15 s on polished cross-sectional area of test materials. In addition, the oxidation behaviours of the produced samples were investigated. Their surfaces morphology were observed by SEM-EDS and the phases in the specimens after the oxidation procedure were detected by XRD analyses.

Keywords: NiAl-CrMo Eutectic Alloy, Electric Current Sintering, Oxidation
ID 383

**Crystalline Growth of Semiconductors: Kinetic Monte Carlo Simulations, Porosity, Dislocations Raman Spectroscopy**

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We simulate the crystalline growth of many types of semiconductors by using the kinetic Monte Carlo technique. Many types of elastic energies are introduced to model the strains and stress. Elementary processes are introduced to simulate the phenomena of deposition: migration, adsorption, intralayers and interlayers diffusion, interstitials and ‘hanging’ atoms, ..... In this study we explore the morphology of compounds as function of experimental conditions (lattice mismatch, temperature, deposition rate, elastic constants, defects in the substrate like steps, cavities, ....). The resulting compounds are studied during the growth, and after ending the growth and the trends to equilibrium. The density of many structures are explored such as defects, porosities, dislocations, interdiffusion, islands, facets, interstitials and ‘hanging’ atoms, ..... In this paper, a special care is taken to study the vibrational properties of this compounds in each case during the growth as function of the deposition parameters. The elastic energy is considered for the relaxation by minimizing the total energy. The vibrational properties are obtained by diagonalizing the dynamic matrix. A Raman spectroscopy is simulated to obtain the shapes of the Raman picks as a function of the different densities of porosity and their clusters, islands, dislocations.

**Keywords:** Kinetic Monte Carlo simulations, porosity, dislocations, crystalline growth, Raman spectroscopy, molecular beam

ID 399

**Micro/nano-scale Gas Transport in Porous Mediums at Slip-flow Regime**

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Gas transport in micro/nano-pores is observed in multiple applications while existing gas permeability values cannot predict the transport at these small scales. As the pore size becomes comparable with the mean free path of the gas molecules, the non-equilibrium gas behavior is observed and classical continuum based flow assumptions fail to describe the gas dynamics. Non-equilibrium gas flow behavior can be classified by Knudsen number (Kn) which is the ratio of mean free path and the pore size. Based on the Kn number slip, transition and free molecular flow regimes can be defined. For the gas flow in slip region solving Navier–Stokes (N–S) equations with modified boundary condition is a simple and effective approach to capture proper flow behavior. In this study, the first order slip boundary condition based on Maxwell model is used to evaluate the slippage effects on permeability. Results are calculated numerically for various networks of micro-square solid rods while transport is characterized by permeability based on porous transport theories.

**Keywords:** Rarefied gas Flows, Velocity Slip, Gas Permeability, Slip Correction
Hydrogen Generation By Hydrolysis of Sodium Borohydride On Co-B/ Magnesite Catalyst
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Hydrogen is considered to be the most promising fuel of the future for various applications. The hydrogen is currently produced by natural gas reforming, coal gasification and biomass pyrolysis. Sodium borohydride insures a safe and practical way to generate hydrogen. The generation of hydrogen by hydrolysis of sodium borohydride has many advantages: high hydrogen storage capacity; stability under alkaline state; hydrogen production appears only in the existence of selected catalyst; hydrogen can be produced at low temperatures, and the hydrogen obtained has high purity. Researchers paid particular attention to transition metal catalysts. Especially, metal boride catalysts synthetized by reduction of metal salts with borohydride became important in catalyzing the hydrolysis reaction. In this study, Co-B catalyst was synthesized by reduction procedure of cobalt (II) chloride solution by alkaline sodium borohydride solution. The catalytic activity of the prepared catalyst was tested by hydrolysis of sodium borohydride in a semi-batch system. Effects of the catalysts amount, sodium borohydride concentration and reaction temperature on hydrogen generation rate were investigated. The hydrogen generation rate was obtained as 15538 mL/min.g at 50°C. The reaction kinetics obeyed the zeroth order kinetic model. The activation energy of reaction was found to be 54 kJ/mol.

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2. Özkar, S., Zahmakıran, M., Hydrogen generation from hydrolysis of sodium borohydride using Ru (0) nanoclusters as catalyst, Journal of Alloys and Compounds, 2005, 404-406, 728 - 731. Keywords: hydrogen generation, sodium borohydride, Co-B catalyst, catalytic

Keywords: hydrogen generation, sodium borohydride, Co-B catalyst, catalytic

Removal of Hexavalent Chromium from Water by Using Natural Brown Clay
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The present study investigates the removal of chromium from aqueous solution, by natural Algerian brown clay, in batch mode, at different temperatures. Kinetic experiment showed that the adsorption process can be simulated by pseudo-second order model. In order to determine the best-fit-isotherm, the experimental data were analyzed by the Freundlich, Langmuir, Temkin and Dubinin-Radushkevich equation, at different temperatures of 293, 303, 313 and 323K. The mean deviation obtained from the four models revealed that Freundlich is the most suitable one. The results showed that natural brown clay is effective to remove chromium (VI) above 90% at 293K.

Keywords: Removal, adsorption, chromium, natural brown clay, kinetic.
Self-Assembled Monolayers of Vitamin B2 Films on Copper: Preparation and Characterization

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Self-assembled monolayers of Vitamin B2 (VB2-SAM) were prepared on copper samples. The SAM films were prepared at different concentrations of VB2 as well as film formation time and optimum conditions were determined. The films were characterized by scanning electron microscopy, energy dispersion X-Ray spectroscopy, atomic force microscopy, contact angle measurements, infrared spectroscopy, X-ray photoelectron spectroscopy and thermal analysis. It was shown that VB2-SAM films could be successfully prepared at all the studied VB2 concentrations and film formation time. But, the properties of the films depend on the preparation conditions. A detailed analysis of the film showed that the films strictly adsorb to the copper surface and homogenously distributed.

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Keywords: Copper, Self-Assembled Monolayer (SAM), Vitamin B2

Preparation, Characterization and Corrosion Inhibition Efficiencies of Methylrhodanine Self-Assembled Monolayers Films: Effect of Solvent

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Self-assembly monolayers (SAM) are dense, compact, well-ordered ultrathin organic films which form spontaneously over the metal surfaces form from active surface compounds. Most of the SAM films are toxic and have hazardous effects on the human and environment. Rhodanine and its derivatives are healthy and have antibacterial, antidiabetic, antiviral, antimicrobial etc. biological applications.

In this study SAM films of methylrhodanine (MRh) were prepared on copper specimens in different solvents. The surface films were characterized using various spectroscopic and microscopic techniques. Their inhibition effect on the copper corrosion was tested in 3.5%NaCl solution using different electrochemical and surface analysis techniques. It was found that MRh-SAM films reduce greatly the corrosion rate of copper in 3.5% NaCl solution. Their protection ability depends on the type of solvent. The best film for this aim was synthesized in 1.0 mM MRh after 24 hour film formation time when ethanol used as the solvent.

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Keywords: Copper, Self-Assembled Monolayer, methylerhodanine
**Mathematical modeling of amorphous layers growth by low energy ion implantation**

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In this work, a simple mathematical model has been developed for the description of amorphous layer growth by low ion energy implantation. The model concerns the lower and higher dose range. It has been assumed that the damage depth distribution can be approximated by a Gaussian. The thicknesses of the amorphous layer and voids film, obtained assuming multi-layer model, have been found in relation to the ion damage straggling and amorphization threshold. The model concept and the corresponding calculations are discussed in details.

**Keywords:** amorphous layers growth; low energy ion implantation; Mathematical modeling

**Development of Composite Structures with Extrusion or Lamination Technologies for Automotive Industry**

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Due to high demands on environmental rules on CO2 emission, decreasing of fossil fuels the lightweight studies are very important for all industries besides in automotive. A lot of studies can be made on lightweight of automotive parts. The composites are very important in lightweight applications. The composite have two or more different materials that combined together to create a superior and unique material. The composites can provide below properties according to ingredients of composites; Lightweight High strength Corrosion resistant High strength-to-weight ratio High impact strength Non-magnetic Low maintenance Long-term durability,... The composites are generally 4 folds lighter than steel, 1,5 folds lighter than Aluminium. In recent years the carbon fiber reinforcement is gained importance. In order to develop lightweight structure some development studies are carried out by extrusion or lamination process. Different materials (polymer, foil, fabric, felt, carbon fiber, ...) are extruded or laminated to use as a internal part of automotive and later the tests are made according to automotive standards (thermal and mechanical behaviour). The obtained test results are compared with related standards’ acceptable values. And than the prototype will be prepared and applied on real product. According to the obtained results, final composites structured will be determined.

**Keywords:** Composites, automotive, lightweight
The wear of the carbide cutting tools coated with TiN during the milling of Inconel 738

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The machining of superalloy parts still an area not very clear in mechanical manufacturing. It is found to be used in particular areas such as gas turbine, rocket engine, space ships, nuclear reactors, and pumps. The machining of Inconel 738 superalloy has been studied in this context, with the aim to understand the wear behavior with carbide inserts coated with TiN and in order to optimize the cutting parameters before starting the production. The wear behavior of the inserts during the machining process of a very tough austenitic superalloy is unclear, and requires a series of well determined tests. The life of the insert under high stress such as pressure, cutting speed, high temperature, in a hostile zone and in contact with a very tough and harder material is determined. The generated process of wear is very complex, because it is followed by physico-chemical phenomenon appearing on the contact surfaces between the active part of the tool and workpiece. The lifetime of machine tools often depends on the tribological characteristics of the material couples (cutting tool / material to be machined). It has been shown that the most influential parameter is the coating, then comes the sliding speed. A relationship between the wear VB and the roughness Ra is proposed to collect information on the cutting edge and the quality of the tool by measuring the roughness. For wear measurement, an indirect method is used in coupling a Touptek photonics camera to capture and Touview analysis software.

**Keywords:** Superalloy, Inconel 738, Cutting speed, drilling, flank wear, crater wear.

Synthesizing submicron AlN powders at low temperature by a new approach of DCRN

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In this work, CRN method was redesigned and delicately tailored in a modified atmosphere controlled tube furnace rotated via servo motor to synthesis spherical and near to nano size of the AlN powder. Herein, we describe a new method for preparing AlN powder from Al(OH)3 has course grain size, as a cheap raw material. Carbon is used reducing agent in mixture. After being mixed with high purity carbon black powder at the molar ratio of 1:21(Al(OH)3/C) mixtures were pelletized and obtained granules were sieved in the range of 1 to 3 mm. Firstly, optimum parameters were determined on the granular form of powder mixture like rotor speed, N2 gas flow and reaction time. After that, two different route were followed to synthesis AlN powder. One of these route, the powders fed into the cylinder reactor made from graphite in a granular form while the mixture was charged into the reactor in powder form and pre-determined alumina ball to powder ratios were also added in order to determine effect of existence of ball on grain size. It was possible to produced AlN powders of mainly below 100 nm size after 90 minutes of dynamic CRN at 1450°C in N2-flow.

**Keywords:** Aluminum Nitride, Dynamic Carbothermal Reduction, Aluminium hydroxide
Synthesis and UV-protecting properties of textiles containing zinc oxide nanoparticles
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In recent years, zinc oxide nanoparticles (ZnO Nps) have been studied in many applications thanks to their unique properties of semiconducting, optical, UV-blocking, antimicrobial, photocatalytic, dermatological, biodegradability, and biocompatibility. Therefore, they have a wide range of applications such as energy storage, photocatalysis, bioimaging, biomedical, optical devices, cosmetics, textile, and solar cells. There are many different methods for the production of ZnO Nps and they can occur in different structures. The properties of ZnO Nps strongly depend on their size and crystal structure. In this work, ZnO Nps were synthesized by a precipitation method at room temperature using zinc nitrate hexahydrate and sodium hydroxide. DLS, XRD and TEM analyses were conducted to characterize the prepared nanoparticles. Investigation of prepared nanoparticles in terms of UV-protection was performed by applying ZnO Nps to cotton fabrics in the presence of chitosan with different concentrations.

Keywords: Zinc oxide nanoparticles, textiles, chitosan, UV-protection
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