ISC'22

2nd International Symposium on Characterization
22-25 September 2022 Afyonkarahisar, TURKEY

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2nd International Symposium on Characterization

ABSTRACT BOOK

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Evcin ArGe

2nd INTERNATIONAL SYMPOSIUM ON CHARACTERIZATION

22-25 SEPTEMBER 2022, TURKEY

Abstract Book

EDITORS

Prof. Dr. Atilla Evcin
Prof. Dr. Ibrahim Gunes

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FOREWARD

2nd International Symposium on Characterization (ISC'22) has been hosted by Afyon Kocatepe University, Engineering Faculty (Afyonkarahisar, Türkiye), in cooperation with TUBITAK Marmara Research Center (Gebze, Türkiye), NED University of Engineering and Technology, Materials Engineering Department (Karachi, Pakistan) and Giresun University (Giresun, Türkiye) at Afyonkarahisar/Türkiye from 22 to 25 September 2022.

We invited valuable scientists from different countries of the world to our symposium. Our 11 invited speakers shared the latest technology and their experiences with our participants. I would like to thank them for their participation in our second symposium.

Main of our symposium is to provide a forum for discussion, to facilitate integration in these fields, and to bring together researchers, scholars, students, and industry from all areas of engineering, technology and science from all around the word.

The symposium included 5 parallel online sessions in which there were invaluable presentations by both national and international presenters. We sincerely thank the presenters, session chair and the students in our department, who contributed so magnificently to the success of the conference.

Nearly 200 oral, online oral and poster presentations from 30 different countries were successfully presented. This is a great success for a second symposium. Another achievement of ours is to enable our academic participants to benefit from the academic incentive regulation by providing 53% of foreigners.

As symposium chair, I give our thanks to the members of the Organising Committee, Scientific Committee, participants from 30 countries, my students for their competent work in setting up the programme.

Prof. Dr. Atilla Evcin
On behalf of the Organizing Committee
Symposium Chair

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INVITED SPEAKERS

Dr. **Zhilun Lu** is a Lecturer (Assistant Professor) at Edinburgh Napier University's School of E ngineering and the Built Environment. He obtained his PhD from the University of Sheffield with the High-Quality PhD Thesis Prize. He then held postdoctoral positions at the Helmholtz-Zentrum Berlin for Materials and Energy (member of the largest scientific organisation in Germany-The Helmholtz Association of German Research Centres) and the Henry Royce Institute (The UK's National Institute for advanced materials research and Innovation).

Dr Lu is a Professional Member (MIMMM) of the IOM3, a Member (MRSC) of the Royal Society of Chemistry and a Member of the American Chemical Society. He is on the editorial boards 5 prestigious materials journals. He serves as a peer reviewer for high impact journals, including Nature Communications, Advanced Functional Materials, Physical Review Letters, Chemistry of Materials, and Acta Materialia. He has also delivered 10+ keynote speeches at international conferences. Dr Lu has published 60+ journal papers (H-index=24). One of his papers was selected as a Hot Article (as one of the top 10% of papers) in Energy & Environmental Science in 2020. And another paper was selected as a Highly Cited Article by Web of Science in 2021.

Dr Lu's research group focuses on the structure-composition-property relations of a broad spectrum of advanced functional materials and the translation of novel materials into prototype devices. Dr Lu is an expert in utilising Impedance Spectroscopy to examine "electrical microstructure", as well as Neutron Scattering to analyse atomic and magnetic structures, the dynamic interplay of quasi-particle and charge transport, including phonon excitations in solids and spin waves in magnetic materials.

Zhi Hong Chen is an associate professor from Wuhan University of Technology. He received his B. S. in 2009 from Central South University, China and Ph. D degree in 2014 from the University of Sheffield, United Kingdom, with "Ceramic Award" for his high quality Ph.D thesis. His research interest focuses on the design, fabrication and characterization of novel electromagnetic functional materials, including electromagnetic absorption materials and metamaterials.

He has been a PI and achieved several funding support from national grants of China. He has published more than about 30 papers in peer-reviewed journals, including *Adv. Mater., Adv. Optical. Mater., Nanoscale, Phys. Chem. Chem. Phys. and J. Appl. Crystallogr. etc*. He is also the author of 3 chapters in two academic books published by Royal Society of Chemistry and World Scientific.

Salih Veziroğlu received his Ph.D. from the Institute of Material Science at Kiel University- Germany in 2020. He got the prestigious Thesis Award by Kiel Nano Surface & Interface Science (KiNSIS) due to his outstanding achievements (co-authorship in more than 19 articles) during his doctoral studies. Currently, he is working as a young group leader (Nano, Energy, and Surface Engineering Group) at the same institute.

He involves many national (e.g, DFG, etc.) and international (e.g, EU, etc.) projects and focuses on the fabrication of metal-metal oxide thin films and particles for photocatalysis, energy, self-cleaning, and sensing applications.

Doktora derecesini 2020 yılında Kiel Üniversitesi-Almanya Malzeme Bilimi Enstitüsü'nden aldı. Doktora çalışmaları sırasında gösterdiği üstün başarıları nedeniyle (19'dan fazla makalede ortak yazarlık) Kiel Nano Yüzey & Arayüzey Bilimi (KiNSIS) tarafından verilen prestijli Doktora Tez Ödülü'nü kazandı. Halen aynı enstitüde genç grup lideri (Nano, Enerji ve Yüzey Mühendisliği Grubu) olarak çalışmaktadır. Birçok ulusal (ör. DFG, vb.) ve uluslararası (ör. AB, vb.) projeye dahil olmakta ve fotokataliz, enerji, kendi kendini temizleme ve algılama uygulamaları için metal-metal oksit ince film ve parçacıkların üretimine odaklanmaktadır.

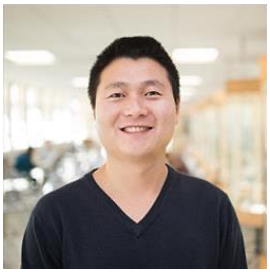
Fayaz Hussain joined the department of Materials Engineering in 2007, first as a Lecturer, then after Assistant Professor in 2010 and promoted as an Associate Professor in 2020. Prior to this, he worked three years in metal industry. He is also editorial board member of journals of "Frontiers in Materials" and "Electroactive Materials". He has completed his PhD from the University of Sheffield, England, UK, in 2016-2017, worked on "KNN based lead-oxide free piezoelectric ceramics".

This ABO3 system has been studied from the perspective of optimizing its performance for multilayer actuators; potentially for energy harvesting applications under the supervision of Professor Ian Reaney at the University of Sheffield. To fabricate the multilayers, a novel Wet-Multilayer-Method (WMM) was also developed to overcome the issues of delamination during firing of multilayers actuators. He has authored/co-authored publications in well reputed journals, around 30 papers including key articles on piezoelectric, capacitor and microwave dielectric ceramics in bulk and multilayers with 238-citations, h-index 8 and i10-index 6 of last five years. Current research interests: ynthesis of Piezoelectric Ceramics and their multilayers, Multiferroics, Thermoelectric Ceramics and Microwave dielectrics. Characterisation Methods: LCR, impedance spectroscopy, d33 meter for piezoelectric coefficient, Vibrating Sample Magnetometer for magnetic properties, XRD Analysis, SEM/ EDX, ferroelectric testing, etc.

Prof. Dr. **Cenk Aktaş**, Orta Doğu Teknik Üniversitesi Malzeme Mühendisliği Bölümü' nden mezun olduktan sonra Christian Albrechts Üniversitesi`nde Malzeme Bilimleri ve Mühendisliği alanında yüksek lisansını tamamladı. 2004 yılında Leibniz-INM Yeni Malzemeler Enstitüsü'nde çalışmaya başlayan Aktaş burada doktora çalışmalarını tamamladıktan sonra iki farklı araştırma grubunun birleştirilmesiyle (Yüzey Teknolojileri Bölümü ve Biyomalzemeler Bölümü) oluşturulan yeni bir bölümün (CVD-Biosurfaces) kurulmasında aktif bir rol oynamış ve bu yeni birimin yöneticiliğine atanmıştır.

Leibniz-INM´de 2016 sonuna kadar sürdürmüş olduğu Bölüm Başkanlığı görevi süresince Aktaş nanomalzemelerin ve nanoteknolojinin endüstrinin farklı alanlarında fonksiyonel uygulamaları üzerine bilimsel çalışmalar ve projeler yürütmüştür. Özellikle nanoteknolojinin tıp ve biyoloji alanında kullanılması alanında öne çıkan araştırmalarına ek olarak, Aktaş nanoteknoloji ile geliştirilen teknik yüzeylerin farklı imalat teknolojilerinde kullanılmasında da laboratuvardan üretime kadar olan süreçleri kapsayan kamu, AB ve endüstri kaynaklı projeler de yürütmüştür. Hem Tıp Mühendisliği hem de Malzeme Mühendisliği alanlarında habilitasyon (doktora sonrası tez çalışması) yapmış olan Aktaş halen çalışmalarını CAU- Malzeme Bilimleri Enstitüsü'nde sürdürmekte olup aynı zamanda da Saarland Üniversitesi Tıp Fakültesi`nde de Kardiyovasküler Biyomalzemeler Araştırma Laboratuvarı`nın eş-koordinatörlüğünü yürütmektedir.

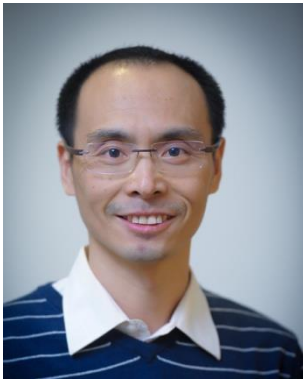
Aktaş bu görevlere ek olarak proje geliştirme ve yönetimi, inovasyon yönetimi, Ar-Ge stratejileri geliştirme ve yönetimi, endüstri-üniversite iş birlikleri ve endüstriyel projeler, up-scale ve teknoloji transfer süreçleri alanlarında farklı endüstri kuruluşlarına ve kamu kurumlarına danışmanlık/eğitim hizmeti vermektedir. Kore Eğitim ve Teknoloji Üniversitesi, Kaiserslautern Üniversitesi, vb. üniversitelerde misafir öğretim görevlisi olarak da görev yapmış olan Aktaş`ın Alman Çocuk Kardiyolojisi Vakfı İnovasyon Ödülü, Prof. Petersen Bilim Ödülü, Prof. Hardt Başarı Ödülü, Uluslararası Tıp Akademisi Ödülü gibi ödülleri bulunmaktadır. Nature, Small, Chemical Society Reviews gibi prestijli bilimsel dergilerde 80` dan fazla bilimsel makalesine ek olarak farklı alanlarda da ondan fazla patenti bulunan Aktaş, 2013 yılında Forbes tarafından dünyada Ar-Ge çalışmalarıyla en fazla fonlama sağlayan yedi Türk Bilim insanından biri olarak gösterilmiştir. Aktaş, yurt dışındaki akademik görevlerine ek olarak T.C. Cumhurbaşkanlığı-Savunma Sanayii Başkanlığı bünyesinde de Savunma Sanayii Akademi Başkanı olarak görev yapmaktadır.



Dr. **Dawei Wang** is a Professor at Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, who was a Research Associate at the Department of Materials Science and Engineering of The University of Sheffield (2014-2020) and a joint PhD student/visiting scholar at the Materials Research Institute of Pennsylvania State University (2010.9-2011.9/2016.4-6).

He received his PhD degree in Materials Processing Engineering from Beijing Institute of Technology in 2012. He is an Associate editor for *Journal of American Ceramic Society* / *Frontiers in Materials* and an Editorial board member for *Materials Today Communications* / *Journal of Advanced Ceramics* / *Journal of Advanced Dielectrics* / *Crystals*. His research focuses on the advanced electronic ceramics for energy storage/conversion/harvesting, and translation of new materials to porotype devices/components for electronic systems. He has published 150+ refereed papers, with a total citation of 5700+ and a google scholar h-index of 45. Also, he holds 20 issued patents and has given 30+ invited talks on international conferences.

Fan Yang (FY) obtained PhD of Materials from The University of Manchester in 2011 and then worked as postdoctoral research associate at The University of Manchester (2011-2014) and The University of Sheffield (2014-2018). In late 2018 FY joined Institute of Fuel Cells, School of Mechanical Engineering, Shanghai Jiao Tong University as an associate professor. FY's major research area is probing the structure-defect-electrical/electrocatalytic properties of oxide-based functional materials.



Dr. **David Fengwei Xie** is currently an EPSRC Fellow and Lecturer at Newcastle University, UK. He was a Marie Curie Fellow at the University of Warwick. Before moving to the UK, he worked as a postdoctoral research fellow/research fellow at the University of Guelph (Canada) and The University of Queensland (Australia). Besides, he had visiting research experiences at Université de Strasbourg (France) and California Institute of Technology (USA). Dr Xie specialises in polymer engineering and science.

His research particularly focuses on biopolymers (polysaccharides and proteins) for both materials and food applications. His interest lies in the modification, processing, and characterisation of biopolymers and the design of biopolymer-based materials and composites with desired application performance.

He has led and involved in multiple research projects with a total research funding of about £5.9M. His research has led to over 130 refereed journal articles with an h-index of 43 and >6900 citations (Google Scholar), 1 monograph, and 5 book chapters. He is an editorial board member for several journals such as Carbohydrate Polymers, Polymers, Coatings, and PLOS ONE.

Attila Alkan. Ankara Üniversitesi Fen Fakültesi Fizik Mühendisliği master çalışmasını tamamladığı elektron mikroskop laboratuvarında 2 yıl uzman olarak çalıştı. Daha sonra sırası ile; Fizik Mühendisliği bölümünde 3 yıl araştırma görevlisi, Çimento Müstahsilleri Ar-Ge mikro inceleme laboratuvarında 4 yıl ve Brisa Ar-Ge mikro inceleme laboratuvarında da 26 yıl elektron mikroskop uzmanı olarak çalıştı. 2019 yılında Kocaeli Üniversitesi Metalurji ve Malzeme Mühendisliği bölümünde Doktora çalışmasını tamamladı.

2017 yılında tamamlanan EUROSTARS ve 2019 yılında tamamlanan EUREKA projelerinde yer aldı.

2012 yılında Brisa'dan emekli oldu. 2014 yılından bu yana Atomika Teknik Cihazlar firması aplikasyon bölümünde elektron mikroskop uzmanı olarak çalışmaktadır. Atomika Teknik firması TESCAN elektron mikroskop ve mikro CT firmasının Türkiye temsilcisidir.

Doç.Dr.**Havva Kazdal Zeytin** 1962 yılında Rize Muradiye Köyü'nde doğdu ve ilkokulu Muradiye Köyü İlkokulu'nda tamamladı. Orta ve Lise eğitimimi İstanbul Nişantaşı Kız Lisesi'nde, Üniversite eğitimimi, İstanbul Teknik Üniversitesi, Kimya-Metalurji Fakültesi'nde , Metalurji ve Malzeme Ana Bilim Dalında (1984) tamamladı. Aynı üniversitede Malzeme alanında yüksek lisans ve doktora yaptı.

1987-1991 tarihleri arasında PARSAT PİSTON A.Ş ve NASAŞ Alüminyum fabrikalarında mühendis olarak çalıştı. 1991'de girdiği TÜBİTAK MARMARA ARAŞTIRMA MERKEZİ Malzeme Enstitüsü'nde Kritik Metalik Malzemeler Grubunun Yöneticisi olarak halen başuzman araştırmacı olarak çalışmaktadır.

Doç.Dr. Havva Kazdal Zeytin, tüm meslek hayatı boyunca metalürji gibi bir ağır sanayi kolunda araştırmacı ve mühendis olarak metal malzemeler ile çalıştı. Çelik sanayi, alüminyum sanayi, süperalaşım malzemeler gibi malzemelerin ileri teknolojilerinin ülkemize kazandırılması, üretemediğimiz katma değeri yüksek malzemelerin geliştirilmesi gibi alanlarda çalışmalar yürüttü. Ülkemizin tamamen yurt dışına bağımlı olduğu Buhar Türbin malzemeleri, Gaz Türbin malzemeleri ve Uçak Motor Türbin malzemelerinin üretimlerin yapılması için alt yapı kurarak teknoloji kazanma ve geliştirme çalışmaları yaptı. Birçok firmanın arge projelerine destek verdi ve TÜBİTAK TEYDEB arge projelerinde proje hakemliği yaptı.

Helikopter, Milli Muharip Uçak, TR Motor gibi kritik ve stratejik projelerin ihtiyacı olan malzemelerin, özellikle uçak motorlarında kullanılan süperalaşım malzemelerin geliştirilmesi için Bütçe ve Strateji Başkanlığı'nın desteklediği bir alt yapının kurulmasında öncülük eden Doç.Dr. Havva Kazdal Zeytin, bu alt yapının geliştirilmesi ve yaygınlaştırılarak ülke hizmetine sunulması için çalışmaya devam etmektedir.

Ayrıca, ulusal ve uluslar arası dergi ve konferanslarda sunulmuş 50 ye yakın bildiri ve makalesi bulunmaktadır.

Microstructural Investigation and Impurity Content of Udimet 720 Superalloy After Triple Melting Steps

Havva Kazdal Zeytin[1], Aylin Şahin Kahraman[2*], Yasemin Kiliç[3], Gökhan Güven[4], Sertaç Alptekin[5], Lütfi Yakut[6]

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Abstract

In the present study, microstructural evolution and impurity contents of as-cast Udimet 720 (U720) superalloy produced by triple melting process (VIM+ESR+VAR) were investigated. U720 is a cast-wrought Ni-based superalloy which is widely used for industrial gas turbine blades due to its high strength corrosion resistance feature. As is the case with most of the other Ni-based superalloys, precipitation strengthening is achived by γ'-Ni_3(Ti,Al), while solid solution strengthening is gotten by Mo,W, Cr and Co in U720. In as-cast microstructure of U720, γ' precipitates, (γ+γ') eutectic phase, MC carbides, metal borides, η-Ni_3Ti phase and Zr-rich phases were defined in a few study, thus there has been still needed to idendify and investigate of these phases in as-cast condition more deeply. These phases are quite important for post-heat treatment and forging process, also they dominate the final strengthening features in service environment. The purpose of this study is characterize to these phases in as-cast condition by comparing with triple melting process (VIM-ESR-VAR). Microstructural characterization (by optical microscopy and SEM-EDS electron microscopy techniques) and impurity (e.g. O-N-H-C-S) content measurement (by thermal analysis devices) were made after each melting step to determine the variation of the phases and impurities. Finally, it was shown that changing of phase evolution and impurity content in as-cast condition after triple melting of U720 alloy.

Keywords: Udimet720 Superalloy, Triple Melting, Microstructure, Impurity Content.

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Dramatic Impact of the Tio_2 Polymorph on The Electrical Properties of 'Stoichiometric' $Na_{0.5}Bi_{0.5}TiO_3$ Ceramics Prepared By Solid-State Reaction

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Abstract

Bulk conductivity (σ_b) of nominally stoichiometric $Na_{0.5}Bi_{0.5}TiO_3$ (NBT) prepared by solid-state reaction collated from literature shows random variation between 10^{-6} -10^{-3} S cm^{-1} (at 600 °C). This makes it challenging to obtain reliable and reproducible performances of NBT-based devices, especially as the underlying reason(s) for this variance are not fully understood. Here we report the dramatic impact of the TiO_2 reagent, in particular, the polymorphic form of TiO_2 on the electrical conductivity and conduction mechanism of NBT. Based on our solid-state processing route, NBT ceramics prepared by rutile TiO_2 are ionically conductive, and those prepared by anatase TiO_2 are insulating. The dramatic difference in electrical properties of NBT prepared using rutile and anatase TiO_2 is related to the NBT formation process: the intermediate phase $Bi_{12}TiO_{20}$ is more stable during formation of NBT in the case of anatase TiO_2, which reduces the volatility of Bi_2O_3 during solid-state reaction. These results give plausible explanations for the large variation of σ_b reported in the literature and highlight the importance of selecting an appropriate TiO_2 reagent when targeting controllable σ_b in NBT-based ceramics. For ion-conducting applications (such as in intermediate-temperature solid oxide fuel cells, IT-SOFCs), rutile TiO_2 should be used, and for dielectric applications (such as in multilayer ceramic capacitors, MLCC) anatase TiO_2 should be used.

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Çimento Fabrikalarında Emisyon Ölçümlerinde Ölçüm Belirsizlikleri İçin Yeni Yaklaşımlar

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Özet

Son dönemde sanayileşme ve kentleşmeye dayalı, son derece yoğun bir enerji kullanan, kaynak tüketen ve karbon emisyonu yüksek bir sektör olan çimento imalatında önemli bir artış meydana gelmiştir. Toplam küresel antropojenik CO_2 emisyonlarının yaklaşık %7'si ve toplam sera gazı emisyonlarının %3'ü çimento üretiminden kaynaklanmaktadır. Bu endüstrinin iklim değişikliği, ekosistem kalitesi, insan sağlığı ve çimento üretimi için kaynaklar üzerindeki olumsuz etkilerini en aza indirmek için çimento üretim sürecinin potansiyel çevresel etkilerinin değerlendirilmesi çok önemlidir. Özellikle kirlilik izlemesinde ölçüm belirsizlikleri ve kullanılan metotlar önem kazanmıştır. Çalışma kapsamında geleneksel hammadde ve yakıt ile geri kazanılan alternatif hammadde ve yakıt kullanımı sonucunda ortaya çıkan kirleticilerin, başta iklim değişimine neden olan karbon dioksit (CO_2) gibi ortaya çıkma potansiyellerinin hesap temelli yöntemlerle belirlenmesi ve belirsizlik bileşenlerinin ortaya çıkarılması amaçlanmıştır. Hesap temelli yöntem ile hesaplanan kirletici ve belirsizlik miktarlarının alternatif geri kazanılan ürünler kullanılarak gerçekleştirilen proses sonucunda ortaya çıkan kirletici ve belirsizlik bileşenlerinin karşılaştırılması yapılmıştır. Çalışma sonucunda; belirsizlik bileşenlerinin hesaplanmasının güçlüğü dikkate alındığında özellikle son yıllardan alternatif yakıtların çimento sektöründe kullanımının kirletici miktarında ve belirsizlik miktarlarında ne gibi değişikliklere neden oldukları ve bunlar için nasıl bir modelleme yapılabileceği hususunda çözüm önerileri getirilmektedir. Çimento endüstrisi, CO_2 emisyonlarını azaltmak için enerji tasarrufu sağlayan ve düşük karbonlu teknolojiler konusunda sürekli olarak araştırma ve geliştirme yapmaktadır. Ayrıca bu çalışma; sistemdeki sera gazı envanterlerinin ve yaşam döngüsünün hesaplanmasına katkı sağlayacak olan çimento sektöründeki CO_2 emisyonlarının belirlenmesi için temel hesaplamalar sunmaktadır.

Anahtar Kelimeler: Çimento Üretimi, Sera Gazı, Ölçüm Belirsizliği, Alternatif Yakıt ve Hammadde

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Nanocrystalline Magnetic Metallic Microwave Absorbents Working at Elevated Temperature

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Abstract

Nanocrystalline magnetic metallic microwave absorbents (nano-MMMAs) are generally single or multi-element magnetic powders with overall dimension in microscale and grain size in nanoscale. They are key components of microwave absorbing composites, since they are able to absorb microwave via both magnetic and dielectric loss due to their excellent soft magnetic properties such as high permeability. However, when nano-MMMAs work at elevated temperature, they suffer from three severe challenges: (i) disordering of magnetic moments due to thermal vibration of atoms, (ii) conversion of ferromagnetism to paramagnetism due to oxidation and composition change, and (iii) fluctuation of permittivity/permeability due to growth of nano-grain. The above challenges could cause significant deterioration in microwave absorbing performance for composites based on nano-MMMAs. In this talk, a short review on strategies to overcome those challenges is presented, followed by two studies on this topic from our group, i.e., (a) grain stabilization by doping of metal hydrides and (b) deformation-thermal co-induced ferromagnetism in austenite metallic powders.

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Image Processing-Based Path Planning and Tracking of Differential Drive Robot

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Abstract

A visual localization of a static environment has developed for differential drive robot using a camera and one ultrasonic sensor is integrated for real time obstacle detection. This combined arrangement is simple and give satisfactory results in path planning and traversing from a given position to final destination. A modified A* search algorithm is developed whereby the path is planned considering the diagonal motion that allows smooth movement of robot at corners. The planned path is traversed based on the PID control of orientation error of robot with respect to the next coordinate in planned path. On a low level, an ultrasonic sensor is continuously checking for real time obstacle that was absent during path planning so as to generate new path if any found

Keywords: Image Processing, Differential Drive Robot, PID control, A* algorithm

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An Internet of Things for Data Security using Artificial Intelligence

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Abstract

Security and privacy of user data become substantial by using Internet of Things (IoT) applications in almost every aspect of human life. Threats are emerging at an impulsive rate retained the current privacy and security measure a big question mark. Artificial Intelligence is currently playing an emergent role in enlightening the traditional cyber security, both the resource limitation and the networking of IoT devices are still great hazards. Several protective approaches are using in Iot application but Machine language caught the attention at most because of its extensive features make it more appropriate for Iot Environment. Machine learning as a subdivision of artificial intelligence smartly monitors the Iot devices and resolve the attack. This paper contributes to a detailed analysis of attacks and its solution using machine learning on the basis of security and privacy.

Keywords: Data Security, IOT, SVM, KNN, K-MEANS

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Comparative Study on TiAlN and TiCN Coatings Tribological Performance for Dental Implant Drills

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Abstract

Nowadays, dental implants are accepted as a reliable treatment option in the oral rehabilitation of patients with partial or permanent tooth loss.The successful implant process related to largely on the primary healing capability of alveolar bone after surgery and the establishment of osseointegration.. It has been indicated that the upper threshold for avoding bone necrosis during implant site preparation ranges between 44°C and 47°C. Therefore temperature must be under control during implant bed preparation because along with mechanical damage to the bone, there is a concomitant temperature rise in the bone adjacent to the implant site. Literature has reported different techniques to reduce the amount of frictional heat generated during. Some of these methods are using cutting edge drills at slow rotation speeds, choosing stepped drill sizes instead of single large drills, intermittent drilling instead of continuous drilling, updating designs for more efficient cutting and using internals and/or external irrigation. In recent years, the application of hard coatings has become an important trend in order to increase the cutting speed and feed rate of modern tools. The use of carbon-based coatings have significantly increased the wear resistance of implants. Also, diamond-like carbon (DLC) coatings have recently received much desired because of their unique mechanical, chemical and thermal characteristics. However, the use of DLC coating is limited due to the large difference in the coefficients of thermal expansion of diamond and steel. Therefore, a variety of Ti, Cr and C based materials have been employed to design and fabricate multilayer coatings for dental drills. This work was aimed at developing nanostructure TiAlN and TiCN coatings intended to be used as wear resistant coating for dry machining. In order to determine the tribological properties of these coatings deposited on 440M stainless steel, were tests were carried out with different counter surfaces such as alumina and glass ball. Analysis of coatings and wear scars surfaces were performed with AFM, SEM/EDX and 3D profilometer.

Keywords : Dental Implant Drill, Bone Temperature, Protective Coatings, Wear Resistance.
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Structural Characterization of Superhydrophobic Silane-Based Nanocomposite Coatings

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Abstract

Superhydrophobic surfaces can attract numerous attentions because of their unique performance such as excellent corrosion mitigation, self-cleaning, drag reduction, anti-icing, anti-bacterial and anti-fouling performance. Superhydrophobic surfaces can be fabricated based on micro- and nano-scale roughness (hierarchical surface structure) along with low surface energy functionalization. A facile method for creating the hierarchical surface structure on metals is chemical etching, which can be turn to superhydrophobic surface by low energy surface modification by fatty acid or fluoropolymers and so on. The drawback of this method is the exposing of the bare metallic surface after removing the low surface energy materials. Hence, this work was focused on fabrication of robust superhydrophobicity on aluminum based on nano/micro hierarchical surface structure through chemical etching and subsequent coating. The micro-scale roughness was obtained by chemical etching of Al and nano-scale roughness was obtained by Al_2O_3 nanoparticles decorating via a silane-based coating (TEOS-GPTMS), which acts not only as a supporting matrix for nanoparticles, but also acts as a protective layer. By functionalization using a flouroalkylsilane (FAS) solution, the superhydrophobic nano/micro hierarchical surface structure was achieved with the water contact angle (WCA) and water contact angle hysteresis (WCAH) of 164° and 2.5°, respectively. The surface morphology was characterized by atomic force microscopy (AFM) as well as scanning electron microscopy (SEM), and the chemical bonding state was explored by Fourier transform infrared spectroscopy (FTIR). The robustness of hydrophobicity of the samples was analyzed by sandpaper abrasion test as well as corrosion mitigation evaluation using potentiodynamic polarization and electrochemical impedance spectroscopy (EIS).

Keywords: Superhydrophobicity, Silane-based, Nanocomposite.

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Dynamic Stability of a Cracked Pipe Conveying Fluid and Lying on an Elastic Foundation

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Abstract

A cracked pipe with a static scheme of a simply supported beam was investigated. It rests along its entire length on a Winkler elastic foundation. The flowing fluid is considered as a non-compressible and heavy. The Galerkin method is employed to approach numerically the problem. Conclusions are drawn on the influence of the crack and the rigidity of the Winkler elastic foundation on the critical flow velocity of the fluid.

Keywords: Pipe, Fluid, Crack, Winkler Elastic Foundation, Critical Velocity.

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Sodyum İyon Bataryalar İçin Ni ve Al Katkılı P2 Tip NaFeMn Katot Malzemelerin Üretimi Ve Karakterizasyonu

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Özet

Lityum-iyon pillerin yaygınlaşan ve çeşitlenen kullanımı ile giderek hızla artan taleple birlikte lityum metalinde ciddi bir maliyet artışı ortaya çıkmıştır. Bu çalışma kapsamında lityum-iyon pillerinde görülen tüketim ve maliyet artışı karşısında alternatif olarak görülen sodyum-iyon pillerin geliştirilmesi için Ni ve Al katkılı NaFeMn katot malzemeleri katı hal üretim yöntemiyle üretilmiştir. Başlangıç kimyasalı olarak yüksek saflıkta oksit tozları kullanılmıştır. Katot tozu üretimi sırasında Al oranı sabit tutulup (x=0.07) değişen oranlarda (x = 0.0, 0.05, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5) Ni katkılaması yapılmıştır. Tozlar 900̊ C'de 6.5 saat ısıl işleme tabi tutulmuştur. Üretilen numunelerin faz oluşumu ve yapısal karaterizasyonları için XRD ve SEM analizleri gerçekleştirilmiştir. Katot çamuru için ağırlıkça %70:20:10 oranlarında sırası ile katot aktif toz, karbon siyahı ve bağlayıcı kullanılmıştır. Elektrokimyasal analizlerde Cr2032 tipi pil hücresi kullanılmış olup pil kapama işlemi yüksek saflıkta argon gazı ortamında yapılmıştır. Pil performans ölçümleri için EİS, CV ve Kapasite-çevrim testleri uygulanmıştır. 1.5- 4.3 V aralığında C/3 akım hızında 100 çevrimde şarj-deşarj kapasite ölçümleri gerçekleştirilmiştir. Sonuçlar en iyi pil performansının x=0.05 Ni katkılı örnekten elde edildiğini göstermiştir. Bu çalışmadan elde edilecek sonuçların yeniden şarj edilebilir piller için yeni katot malzemelerin geliştirilmesi çalışmalarına olumlu katkıları olması beklenmektedir.

Anahtar Kelimeler: Yeniden şarj edilebilir piller, Lityum-iyon piller, Sodyum-iyon Piller, Katot Malzemesi, Ni-katkılama, Al-katkılama.

Açıklama
Çalışma kapsamında mali destek sağlayan 220N335 numaralı proje ile TÜBİTAK'a ve 21.FEN.BİL.40 numaralı proje ile Afyon Kocatepe Bilimsel Araştırmalar Proje Birimi'ne teşekkür ederiz.

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Evaluation of The Effect of Using Phase Change Material on Building Fuel Cost

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Abstract

In this paper, the effect of using phase change materials for insulation purposes on building fuel performance was investigated. The fuels examined within the scope of the study are natural gas and coal. Depending on the fuel type, the effect of using phase change materials on annual fuel costs was compared. For this purpose, the analyzes were carried out for the provinces of Istanbul and Erzurum in Turkey. The total fuel cost changes for the reference building used in the study were determined and the amount of energy savings that could be achieved in a year were determined. While the province of Istanbul mentioned in the study is in the second-degree climate zone, Erzurum is in the fourth-degree climate zone. In addition, the thermal conductivity coefficient of the phase change material used in the analysis is 0.2 W/mK, and the thermal conductivity value of the standard insulation material is 0.02432 W/mK. As a result, it has been determined that the use of phase change material as insulation material in the building reduces the building fuel costs for both climate zones.

Keywords: Thermal performance, phase change material, fuel cost, energy saving.

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Effect of the Use of Phase Change Material as an Insulation Material in the Building on the Energy Performance of the Building

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Abstract

In this study, the effect of using phase change material instead of the standard insulation material used in a building on the thermal performance of the building was investigated. The results of the application of materials with different thermal conductivity coefficients on the outer shell of the building were compared. The first of these is the most widely used standard insulation material and its thermal conductivity coefficient is 0.02432 W/mK The other is a phase change material with a thermal conductivity coefficient of 0.2 W/mK The aim of the study is to investigate the effect of two different types of materials with different thermal conductivity coefficients applied to the exterior of the building on the energy performance of the building. Numerical analyzes within the scope of the study were made using the EES program. In addition, the energy performance comparative analyzes examined in the study were made for the climatic conditions of Antalya and Ankara provinces in Turkey. Antalya is located in the 1st degree climate zone and has a temperate climate. Ankara is located in the 3rd degree climate zone and has a continental climate. A sample building with the same dimensions was used as a reference for both regions. Considering the results of the analysis, the use of phase change material as insulation material instead of standard insulation material increased the energy performance for both regions and contributed to energy savings.

Keywords: Thermal insulation, phase change material, thermal performance.

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Improvement the Adsorption of Grape Marc Biochar In Tetracycline Absorption: With Pyrolysis Assisted Alkali Activation

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Abstract

The abuse of antibiotics poses a threat to the ecological environment and biological health, and how to effectively reduce the residue of tetracycline (TC) in the environment has attracted much attention. In this study, three types of grape marc biochar (ACs: AC300, AC500, and AC700) were prepared using agricultural waste grape marc at different pyrolysis temperatures to remove TC from water. The results show that with the increase of pyrolysis temperature, the number of surface functional groups of AC gradually decreases, the aromaticity increases, the polarity decreases, and the specific surface area of AC increases. These changes in physicochemical properties improve the adsorption capacity of AC. The AC300 and AC500 conform to the Langmuir isothermal adsorption model, while the AC700 is more compatible with the Freundlich model. The secondary kinetic model can better fit the adsorption process of three ACs to TC. With the help of machine learning, the relationship between the physicochemical properties of BC and the adsorption capacity of TC was effectively explored. The random forest model was able to fit the adsorption process of BC on TC better. It is expected that this study will guide the rational application of BC in the treatment of TC wastewater.

Keywords: Antibiotic; biochar; sorptive removal; water pollution; tetracycline.

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Determination of Steel Strand Effect on Dynamic Parameters of Composite Structure

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Abstract

The destructive effects of earthquakes on structures are known. In addition, the harmful effects of environmental vibration and effects should not be ignored. This requirement is known to cause changes and developments in building designs. There are various studies and applications to minimize the effects that will affect the structure. Keeping the building mass low in designs is among the priorities. Composite structures were born out of this need. The aim in composite structures is based on the principle of carrying more load with lower mass. However, in composite structures, depending on the effects, the need for reinforcement may arise or there may be design difficulties. In this case, it may be considered more logical to use the reinforcement method with steel strands in order to adhere to the principle of carrying more load with a lower mass. It has been proven in many studies that the reinforcement method with steel strand increases the rigidity of the structure by placing a relatively small mass on the structure. In this study, the effects of steel strand reinforcement in a sample composite structure are revealed by making modal analysis using the finite element method. In particular, the structure vibration periods and free vibration mode shapes of the first 5 modes are discussed in detail. Thus, the positive effect of the use of steel strand the rigidity of the composite structure has been more clearly demonstrated. As a result of all these studies, the reinforcement method with steel strand can be used in composite structures.

Keywords: Composite structures, Steel strand, Finite element method, Dynamic parameters, Reinforcement

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Investigation of Shear Wall Effect on Dynamic Parameters of Reinforced Concrete Building

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Abstract

Today, the use of reinforced concrete structures is very popular in the world. It is known that reinforced concrete structures are affected by earthquake effects like all other building types. In addition to this situation, reinforced concrete structures are affected by environmental vibrations like all other objects. Due to all these effects, reinforced concrete structures may lose their bearing capacity over time. In this case, it causes very dangerous results such as collapse of the structure. Various proven retrofit methods are available to solve such problems. The use of shear walls is one of these retrofit methods. It has been proven in many studies that the shear walls reinforcement method is quite common. In this study, the effects of shear walls in a sample reinforced concrete building are revealed by making modal analysis using the finite element method. In particular, the structure vibration periods and free vibration mode shapes of the first 5 modes are discussed in detail. Thus, the positive effect of shear walls on the rigidity of the structure has been more clearly demonstrated. In the light of all this results, the method of shear walls can be used in the reinforcement of reinforced concrete buildings

Keywords: RC structures, Shear walls, Finite element method, Dynamic parameters, Retrofitting

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The Effect of Steel Strip on Dynamic Parameters of Steel Structure

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Abstract

The destructive effects of earthquakes on structures are known. In addition, the harmful effects of environmental vibration and effects should not be ignored. This requirement is known to cause changes and developments in building designs. There are various studies and applications to minimize the effects that will affect the structure. Steel structures are a type of building that has increased its popularity from past to present. Especially with its homogeneous material structure, steel structure comes to the fore in earthquake resistant building design. However, in steel structures, depending on the effects, the need for reinforcement may arise or there may be design difficulties. In this case, it may be considered more logical to use the reinforcement method with steel strips in order to adhere to the principle of carrying more load with a lower mass. It has been proven in many studies that the reinforcement method with steel strips increases the rigidity of the structure by placing a relatively small mass on the structure. In this study, the effects of steel strip reinforcement in a sample steel structure are revealed by making modal analysis using the finite element method. In particular, the structure vibration periods and free vibration mode shapes of the first 5 modes are discussed in detail. Thus, the positive effect of the use of steel strip the rigidity of the steel structure has been more clearly demonstrated. As a result of all these studies, the reinforcement method with steel strip may be used in steel structures.

Keywords: Steel structures, Steel strip, Finite element method, Dynamic parameters, Reinforcement

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Atık Keklerinin Porselen Karo Bünyesinde Değerlendirilmesi

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Özet

Bu çalışmada, fabrikamızın üç adet arıtma ünitesi bulunmaktadır. Bu arıtma üniteleri fabrikanın farklı bölümlerindeki atıklardan oluşmaktadır. Atık üniteleri A, B ve C atık üniteleri olarak isimlendirilmektedir. A atık ünitesi, hazırlama, B atık ünitesi, polisaj, C atık ünitesi ise sırlama, ebatlama ve dekor bölümündeki atıklardan oluşmaktadır. Çalışma kapsamında, bu üç atık tek bir harmanlama yapılarak 55*110 mm ebatlarında preslenip, pişirilmiştir. Pişirilen atık numunelere standart analizler uygulanıp, karışım halleri incelenmiştir. Uygun olan atık karışımı, standart bünye reçetesine ilave edilerek preslenip rulolu fırında pişirilmiştir. Pişirilen numuneler incelenip, standart ile kıyaslanarak değerlendirilmiştir. Yapılan çalışma sonucunda, %6 atık ilaveli reçetenin uygun olduğu görülmüş olup, reçete kullanılan ithal kilinden %50 ve birim maliyetinde %25 azalma olduğu anlaşılmaktadır.

Anahtar Kelimeler: Atık Minimizasyonu, Temiz Üretim, Atık Kullanımı, Porselen Karo

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Porselen Karo Üretiminde Kullanılan Massenin Tane Boyut Dağılımının Mekanik ve Fiziksel Özelliklere Etkisinin Araştırılması

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Özet

Porselen karolar sırsız ve sırlı olarak iki sınıfta incelenmektedir. Kullanılan hammaddelerin %35-40 kil %10-20 kuvars ve %35-40 oranında feldspat mevcuttur.
Kimyasal ve mekanik özellikleri (pişmiş kırılma mukavemeti, ham mukavemeti, aşınma direnci) yüksek % su emme değeri <%0.5 düşük amorf bir matris içerisinde kristal fazlar içeren 1205°C yüksek sıcaklıkta pişirilen kaplama malzemesi olarak adlandırılır.
Bu çalışmada kapsamında porselen karo üretiminde kullanılan bünyenin, tane boyut dağılımın azaltılması ile mekanik ve fiziksel etkileri incelenecek aynı zamanda sinterleme davranış ilişkileri araştırılmıştır. Reçete seger formulasyonuna göre oluşturulmuştur.Bu çalışmada referans numune ile beraber toplam 4 çalışma incelenmiştir. Çalışma numuneleri Seranit firmasına ait Sacmi markalı endüstriyel fırında 55 dk 1210°C'de pişirilmiştir. Fiziksel ve mekanik (%su emme % küçülme, eğilme. kırılma dayanım sonuçları, renk analizi) ,kimyasal ve tane boyut analizleri(XRD, XRF tane boyut analizi, optik dilotometre, ergime davranışı, EDX analizi ve SEM görüntüleri) yapılmıştır. Yapılan çalışmalar sonucunda tane boyutun düşmesi ile mukavemet(kırılma yükü(kg) ve eğilme dayanımı(N/mm2) değerleri artmıştır. Sinterleme, yumuşama ve yarı küre sıcaklığı tane boyutun azalması ile liner bir şekilde azalmıştır. Sonuç olarak tane boyutun azalması ile endüstriyel fırınlarda daha düşük sıcaklıkta pişebileceği ve böylece daha az enerji tüketileceği görülmüştür. Bu çalışmada mevcut farklı basınçlarda preslenen numunelerin pişme sonrasında mekanik ve fiziksel özellikleri incelenmiştir. Aynı zamanda basınç değerinin artmasını ile sinterleme davranışı araştırılmıştır.

Anahtar Kelimeler: Porselen karo, seramik karo ,tane boyut, sinterleme davranışı

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Stainless Steel and Inconel 718 Alloys Fabricated through Powder Bed Fusion and Directed Energy Deposition Manners

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Abstract

3D printing (AM) takes the interest of a large community [1]. Among AM manners, directed energy deposition (DED) [2,3] and powder bed fusion (PBF) based are the most frequent. Owing to outstanding mechanical properties, stainless steel and nickel alloys are used in aerospace applications. The microstructure has an influence on the mechanical properties of metallic materials [4]. Inconel 718, and stainless steel were fabricated using DED and PBF. OM was used to study the microstructure of PBF stainless steel where a very fine equiaxed grain structure was observed as it differs from the dendritic microstructure of DED steel. The DED and PBF Inconel reveals a microstructure with cellular dendrites but SLM Inconel is finer which is attributed to the cooling rate differences between DED and PBF. Unlike Inconel, PBF process causes equiaxed grain formation in stainless steel. AM method is observed to have a certain influence on microstructure. Replacement of conventional manufacturing methods with AM manners still requires time and understanding the microstructures are one of the milestones to reach. Besides, enhancing the part quality is a difficult task, and better knowledge of the potential microstructure of the parts made by AM would contribute to this goal.

Keywords : Powder Metallurgy, 3D Printing, Characterization, Aerospace materials. *

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Growth Performance, Semen Quality Characteristics and Hormonal Profile of Male Rabbit Bucks Fed Rubia Cordifolia Root Extracts

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Abstract

32 – 7 weeks weaned male rabbits (Newzealand × Chinchilla) weighing 611.3 ± 10 g were randomly distributed into 4 groups of 8 rabbits per treatment with one animal per replicate in a completely randomized design. Rabbits in treatment 1 (control) designated as T1 was fed basal diet with 0 mL *Rubia cordifolia* root extracts (RCE) while T2, T3 and T4 were fed basal diet with 20 mL, 40 mL and 60 mL per litre of water/day. Basal diet was formulated to meet the nutrient requirements of growing rabbits according to the recommendation of National Research Council (NRC, 1977). The experiment lasted for 12 weeks during which strict biosecurity measures were observed. Feed and water were also given *ad libitum*. Gas chromatography mass spectrometry of *Rubia cordifolia* root extracts reveals the presence of 21 bioactive compounds which accounts for 92.46 %. 9-Octadecenoic acid had the highest concentration (29.16 %) while 4-Methoxy-2-nitroformanilide had the lowest concentration (0.02 %). Average body weight gain (ADWG) and feed conversion ratio of rabbits in T4 were better ($P<0.05$) compared to the other treatments. Average daily feed intake (ADFI) in T1 was similar to T2 and T3 but slightly higher than T4 ($P>0.05$). Highest mortality was recorded in T1 (2.51 %) followed by T2 (0.05 %) none was recorded in T3 and T4 ($P<0.05$). Testosterone, luteinizing hormone and thyroid stimulating hormone values were significantly ($P<0.05$) influenced by the treatments while follicle stimulating hormone were not significantly ($P>0.05$) different among the treatments. Semen results showed a significant ($P<0.05$) decrease in sperm concentration, live sperm and motility with a significant ($P<0.05$) increase in abnormal sperm compared to the other treatments. It can be concluded that *Rubia cordifolia* root extracts has bioactive compounds with therapeutic properties and could be tolerated by rabbit bucks up to 60 mL per litre without causing any negative effect on the general health and performance of animals.

Keywords: *Rubia cordifolia* root extracts, performance, phytochemicals, hormones, semen
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Characterization of Gadolinium-Doped Silane-Based Surfaces

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Abstract

The importance of the study is that the antibacterial activity and solutions with appropriate content are determined on the glass material surfaces and nanofibers are created and applied to increase the mechanical adhesion of the coating on the surface.
In this study, gadolinium-doped and non-doped solutions based on silane were used. Nanofibers were obtained on equivalent glass surfaces using an electrospinning device. Elemental analysis and nanofibre formations of nanofibre coated surfaces obtained by SEM-EDX analysis machine, phases of materials used in solutions with XRD device, activities of surfaces against S.aereus and E.coli bacteria with antibacterial test, presence of component structure used in solutions with FT-IR device, surface contact angle and the effectiveness of liquid on surfaces were examined.
As a result of the examination, all the findings formed on the surface of the glass material were analyzed by comparing.

Keywords**:** Antibacterial, Silane, Gadolinium, Nanofiber.

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Si_3N_4 Esaslı Su Bazlı Sistemlerde Farklı Dispersanların Etkisinin İncelenmesi

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Özet

Biyomalzemeler; canlı sistemlerle etkileşimler yoluyla, herhangi bir terapötik veya teşhis prosedürünün seyrini yönlendirebilecek bir form almak üzere tasarlanmış malzemelerdir. Silisyum nitrür (Si_3N_4); mukavemet, kırılma tokluğu ve osteo-iletkenlik gibi çeşitli mükemmel özelliklerle ayrıca antibakteriyel etkiye sahip bir malzemedir. Bunlar spinal implant gelişimi için gerekli olan malzeme özellikleridir. Bu çalışmada, geleceğin potansiyel biyomalzemelerinden biri olan poroz silisyum nitrür (Si_3N_4) malzemesinin kemiğe benzer morfolojiye sahip ve fonksiyonel olarak derecelendirilmiş şekilde porozite içeren malzeme elde etmek amacıyla su bazlı süspansiyonlarının 24 saat karıştırma işlemiyle hazırlanması, su bazlı sistemle uyumlu olan katyonik dispersan Polietilenimin (PEI) ve anyonik dispersan Amonyum Poliakrilat'ın (DARVAN C-N) su bazlı sistem içerisinde sterik kuvvetlerinin karşılaştırılarak en uyumlu dispersan seçimi, süspansiyon reçetelerinin optimizasyonu, şerit döküm işleminin 3 cm/dk hızda yapılarak ham şeritlerin üretimi yapılmıştır. Optimum koşullarda döküm işlemi gerçekleştirilmiştir. Yapılan deneysel çalışmalarda hammadde Si_3N_4'ün dışında solvent, bağlayıcı, plastikleştirici, sinterleme katkısı ve por yapıcı kullanılmıştır. Ardından üretilen ham şeritler fonksiyonel geçişe izin verecek şekilde lamine edildikten sonra 2000 bar basınçta 2 dk süreyle soğuk izostatik olarak preslenmiştir. Soğuk şekillendirilen seramik ham şeritlerin 900°C'de ön sinterleme ardından 1500-1550-1600-1650°C'lerinde hem hava hem de azot atmosferinde sinterleme işlemleri gerçekleştirilmiştir. Kullanılan hammaddelere XRD, SEM, XRF analizi yapılıp hazırlanan süspansiyonun zeta potansiyeli ve reolojik ölçümleri, sinterlenen numunelere ise XRD ve SEM analizleri yapılarak şeritler arasında bağlanma, dispersan etkisi, artan sıcaklıkla birlikte porozite davranışı incelenmiş ve faz analizleri yapılmıştır. SEM, XRD, reoloji ölçümleri kapsamında en iyi sonucu veren dispersanın katyonik dispersan olan Polietilenimin olduğu ve 1650°C'de azot gazı altında sinterlenen numune grubunda olduğu saptanmıştır.

Anahtar Kelimeler: Silisyum Nitrür, Fonksiyonel Derecelendirilmiş Malzeme, Polietilenimin, Biyomalzeme.

Teşekkür: Çalışma kapsamında mali destek sağlayan 120N266 numaralı proje ile TÜBİTAK'a teşekkür ederiz.

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Ti Yüzey Üzerine Biyouyumlu EPD Kaplama Uygulamasında Voltaj, Zaman, Diyotlar Arası Mesafe Deney Parametrelerinin Etkisi

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Özet

Bu çalışmada, elektroforetik kaplama yöntemi ile biyomalzeme uygulamalarında kullanılmak üzere Ti altlık üzerine kaplama uygulaması yapılmıştır. Kaplama çözeltisi Tricalcium Phosphate (TCP), Bovine Skin Gelatin, Chitosan, Asetik Asit ve su ile hazırlanmıştır. Çözeltinin hazırlanması Süspansiyon 1 ve Süspansiyon 2'nin hazırlanması şeklinde iki aşamada gerçekleştirilmiştir. İlk olarak Chitosan ve Asetik Asit 5 saat boyunca karıştırılmıştır. Buna paralel olarak TCP ve su 4 saat boyunca karıştırılmış, TCP ve su karışımına jelatin ilave edildikten sonra 1 saat daha karıştırılmıştır. Hazırlanan bu iki karışım birleştirilerek Süspansiyon 1 oluşturulmuştur. Ardından Süspansiyon 1 karışımı 2 saat boyunca karıştırılmıştır. Süspansiyon 2'nin hazırlanması için ise TCP, jelatin ve su karışımı 2 saat boyunca karıştırılmıştır. Süspansiyon 1 ve Süspansiyon 2 olarak hazırlanan karışımlar birleştirilmiş ve 19 saat boyunca karıştırma işlemine tabi tutulmuşlardır. Böylece kaplama çözeltisi hazır hale getirilmiştir. Yapılan bütün karıştırma işlemleri manyetik karıştırıcı ile oda sıcaklığında ve 300 rpm hızda yapılmıştır.

Güç kaynağının katot (-) kutbuna bağlanmış olan Ti malzeme ve anot kutbuna (+) bağlanmış olan çelik malzeme, birbirlerine paralel duracak şekilde kaplama çözeltisi içerisine daldırılmıştır. Sonrasında güç kaynağından voltaj uygulanarak kaplama uygulaması yapılmıştır. 14 farklı deneme ile hazırlanan kaplama uygulamalarında voltajlar 15 V ve 30 V, diyotlar arası mesafe 0,5 cm ve 1 cm, uygulama süresi 20 s, 60 s ve 120 s olarak denenmiştir. Kaplama esnasında çözeltilerin karıştırılmasına devam edilmiştir. Ayrıca çözeltinin iletkenliğini arttırmak amacıyla APS ve BYK katkılı kaplama uygulamaları yapılmıştır. Çözeltinin pH'ının etkisini incelemek amacıyla fazladan Asetik Asit ilavesi ile ve %20'lik NaOH ilavesi ile kaplama uygulamaları da yapılmıştır. Kaplama işlemi sonrasında numuneler 4 saat boyunca etüvde bekletilmiştir. Kaplanan numunelerin taramalı elektron mikroskobu (SEM) ile yapılan mikroyapı analizlerinde uygulama esnasındaki parametrelerin kaplama kalınlıklarına etkisi incelenmiştir. Yapılan deneysel çalışma sonucunda denenmiş olan farklı

voltaj değerlerinden 15 V, farklı sürelerden 20 saniye ve diyotlar arası mesafenin 0,5 cm olduğu numune gruplarına (deneme no: 9-14) ait olan numunelerin daha iyi kaplandığı görülmüştür. Bu deneme gruplarından ise en iyi kaplamanın katkı içermeyen deneme 10 koduna (15 V, 20 sn, mesafe 0,5 cm ph:4) ait olduğu saptanmıştır.

Anahtar Kelimeler: Elektroforetik kaplama, Titanyum, Biyomalzeme, Chitosan

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Textile-Based Quad-Band Electromagnetic Absorber Design for Wearable Applications

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Abstract

In this paper, a textile-based quad-band electromagnetic absorber is presented for wearable applications in the S-band frequency range. Two asymmetric X-shaped resonators are placed on denim fabric used as a substrate to achieve absorber configuration providing quad-band performance. The back side of the substrate is fully covered with a metallic plate as the ground plane to shield transmission. The X-shaped resonator structures and ground plane are made of conductive copper tape and conductive fabric, respectively. Analysis and design of the proposed absorber are carried out by using CST Microwave Studio Suite. The absorber provides over 0.98 absorption peaks at 2.49, 2.63, 2.81, and 2.97 GHz in the simulation environment. Also, the proposed absorber's lumped equivalent circuit model is obtained through AWR-Microwave Office Circuit Design Software. Moreover, the absorber design was fabricated, and then its prototype was measured to validate the numerical results. A good agreement can be achieved between simulated and measured absorption characteristics.

Keywords: Textile Absorber, Wearable Absorber, Quad-band Absorber, Multi-Band Absorber.

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Epoksi Reçine ile Kaplanmış Ahşap Malzemede Sıcak-Soğuk Şok Testinin Parlaklık ve Pürüzlülük Değişimlerine Etkisi

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Özet

Bu çalışmada, sarıçam (Pinus Sylvestris Lipsky), Doğu kayını (Fagus Orientalis L.) ve Anadolu kestanesinden (Castanea sativa Mill.) ISO 3129'e göre hazırlanan örnekler, TS ISO 13061-1'e göre iklimlendirilmiş, yüzeylerine ASTM-D 3023 esaslarına göre epoksi reçine uygulanmıştır. Çalışmada, örneklerin sıcak-soğuk şok etkisi öncesi ve sonrası pürüzlülük (TS 2495 EN ISO 3274 ve TS 6212 EN ISO 4288'e göre) ve parlaklık (TS 4318 EN ISO 2813'e göre) değişimlerinin belirlenmesi amaçlanmıştır.

Bu kapsamda 100x100x10 mm ebatlarında hazırlanan yüzey işlemli test numuneleri ASTM D1211-97'e göre önce 50 ± 5°C sıcaklıkta 1 saat fanlı kurutma fırınında bekletilmiş, ardından 1 saat -20 ± 2°C sıcaklıkta tutulmuştur. Bu işlemler 1 devir olarak kabul edilmiş ve testler 15 devire kadar devam ettirilmiştir. Daha sonra Konica Minolta Multi Gloss 268 Plus" parlaklık ölçüm aleti (Gloss-metre) ile 60º±2º'de liflere dik/paralel parlaklık olmak üzere çift yönde ölçüm ve yüzey pürüzlülük ölçümleri TIME marka TR-220 model yüzey pürüzlülük ölçüm cihazıyla belirlendi.

Sonuçlara göre; sarıçam (Pinus Sylvestris Lipsky), Doğu kayını (Fagus Orientalis L.) ve Anadolu kestanesi (Castanea sativa Mill.) epoksi reçine kaplı ahşap malzeme yüzeylerin hepsinde sıcak-soğuk şok etkisi sonrası parlaklık azalması gerçekleşirken, pürüzlülük düşüşü tespit edilmiştir. Değişen hava şatlarına karşı yüzey işlemli ahşap malzemelerin parlaklık ve pürüzlülük değerleri kullanılan üst yüzey maddesinin kullanışlılığını belirleyebilir. Bu çalışmada elde edilen bulgular, farklı iklim koşullarındaki ülkelere hava deniz ve karayolu taşımacılığı ile mobilya ihracatı yapan üreticilerin bilgilendirilmesi açısından katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Ahşap Malzeme, Epoksi Reçine, Parlaklık, Sıcak-Soğuk Şok Testi, Yüzey Pürüzlülüğü.

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Sodyum İyon Piller 3'lü Metal Oksit Yapıların Yapısal Özellikleri ve Pil Performanslarının Araştırılması

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Özet

Sodyum iyon şarj edilebilir pilleri ticarileştirmek için her bir bileşen için yoğun çalışmalar yapılmaktadır. Elektrot malzemesinin bileşenlerinin maliyeti ve yeryüzünde ki bolluğu ticarileştirilmesinde ki en önemli etken olduğu bilinmektedir.
Demir ve manganez esaslı metal oksitler düşük üretim maliyetleri, yeryüzünde ki bolluğu ve çevre dostu olması nedeniyle ticarileştirmek için güçlü bir aday olarak gösterilmektedir. Bu anlamda sodyum metal oksitler önce çıkmaktadır ve çoklu metal içeren yapıların son yıllarda daha çok dikkat çektiği bilinmektedir. Demir-mangan-kobalt içeren sodyum metal oksit yapıların sentezlenmesi modifiye edilmiş katıhal reaksiyon yöntemi kullanılarak gerçekleştirilmiştir. Katot malzemelerin yapısal karakterizasyonları SEM, X-ışını kırınımı (XRD) ve FTIR spektroskopisi ile belirlenmiştir. Elde edilen tozlar katot üretiminde kullanılmış ve CR2032 yarım hücre tipi piller hazırlanmıştır. Üretilen pillerdeki redox reaksiyonları belirlenerek üçlü metal oksitlerin batarya yapısı ile etkisi incelenmiştir.

Anahtar Kelimeler: Cobalt, Na iyon pil, Şarj edilebilir

Bilgilendirme
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Na-İyon Pillerde Ticarileşme Potansiyellerinin Belirlenmesi İçin Tam Hücre Oluşum Proseslerinin Araştırılması

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Özet

Son yıllarda elektrikli araçlara olan ilgiden dolayı pillere olan talepte oldukça artmıştır. Günümüzde ticari olarak Li-iyon piller her kullanıma uygun olarak üretilmektedir. Li-iyon piller birçok avantajı olsa da doğadaki rezervinin az olması dolayısıyla maliyetinin yüksek olması Li-iyon pillerde dezavantaj olarak görülmektedir. Na elementinin doğada bol olması ve yapısal olarak Li elementine benzer özellikler göstermesinden dolayı Na-iyon piller Li-iyon pillere alternatif olarak gösterilmektedir. Na-iyon pillerde katot ve anot malzemeleri yarım hücre performansları oldukça iyidir. Na-iyon pillerin ticarileşmesi için en önemli adımlardan biri tam hücre yapısını oluşturmaktır. Bu çalışmada $Na_{0.67}Mn_{0.5}Fe_{0.43}Ti_{0.07}O$/Hard Carbon kullanılarak tam hücre oluşum yöntemleri incelenmiş ve batarya performansları belirlenmiştir. Özellikle SEI tabakasının oluşumu sırasında azalan sodyum iyon sayısının önüne geçilmesi için ön sodyumlama çalışmasının optimizasyonları araştırılmıştır. Yapılan tam hücre testlerinde hücrelerin EIS, CV ve döngü performansı analizleri incelenmiştir.

Anahtar Kelimeler: Na-iyon, Tam hücre, Oluşum.

Teşekkür: Bu çalışma TUBITAK 220N335 numaralı proje kapsamında yapılmıştır. Tübitak'a verdikleri maddi desteklerinden dolayı teşekkür ederiz

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Doğaltaş Üretim Tesisleri Atık Granit Tozunun Beton Katkı Maddesi Olarak Kullanılabilirliğinin İncelenmesi

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Özet

Doğaltaş Elemanları Üretim Tesisine gelen granit bloklarından, uygulama yapılacak çalışma ile ilgili istenilen ölçü, ebat, şekil, kullanım alanına uygunluk v.b. durumlarına göre belli başlı işlemler yapılması gerekmektedir. Bu yapılan işlemlerin birçoğu elmas soket kesim ile yapılmaktadır. Büyük ölçekli blok taşların bu işlemler sırasında meydana gelen atık granit tozunun çevreye etkisini minimize etmek için elmas soket ile kesme işlemlerinde tazyikli su takviyesi yapılmaktadır. Doğaltaş Elemanları Üretim Tesisinde oluşan bu atık granit tozunun su ile karışımı sonucu ortaya çıkan çamur bertaraf edilmek üzere katı atık bertaraf sahasına aktarımı yapılmaktadır. Çevreye ciddi sorunlar oluşturan atık granit tozunun etkilerini en aza indirmek ve ekonomiye yeniden kazandırılması için beton karışımında kullanılması çalışması yapılmıştır. Yapılan çalışmanın amacı, beton karışımında atık granit tozu kullanarak çevreci bir beton elde edilmesini sağlamaktır. Üretilen betonun dayanım ve dayanıklılık özelliklerini, taze ve sertleşmiş beton üzerine olan etkilerini belirlemektir.

Deneylerde; atık granit tozu ile üretilen çevre dostu betonların karışım hesabında kullanılan atık granit tozu miktarı, hacimce toplam karışımın, %0, %2, %4'ü şeklinde aynı zamanda iri ve ince agrega yerinde yer değiştirerek kullanılmıştır. Üretilen betonların çimento oranı iki farklı (350 kg/m3 ve 425 kg/m3) şeklinde ve agrega granülometrisi ise üç farklı (%65 İnce-%35 İri), (%55 İnce-%45 İri), (%45 İnce-%55 İri) şeklinde kullanılmıştır. Üretilen çevre dostu betonların, taze ve sertleşmiş beton özellikleri tespit edilmiştir.

Sonuç olarak, atık granit tozunun beton karışımında kullanarak çevre dostu betonun üretilmesinin mümkün olduğunu, çevre kirliliğini azalttığını, insanların sağlığına ve doğaya fayda sağladığını, aynı zamanda kaynakların az tüketilmesi ile ekonomiye katkıda bulunacağını söylenebilir.

Anahtar Kelimeler: Doğaltaş, Doğaltaş Atıkları, Çevre Dostu Beton, Granit Tozu, Atık yönetimi, Beton Katkısı

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Şerit Döküm Yöntemiyle Alümina Matrisli Zirkonya Takviyeli Elektronik Altlık Üretimi

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Özet

Bu çalışmada alümina matrisli zirkonya takviyeli kompozit şerit döküm yöntemi ile üretilmiş, takviye zirkonya oranı ağırlıkça % 2.5-10 arasında değiştirilerek Al_2O_3-ZrO_2 kompozitlerinin mekanik, mikroyapı, yüzey pürüzlülük ve dielektrik özellikleri üzerine etkisi araştırılmıştır. Bu doğrultuda elektronik alanda üretilen malzeme ile tasarlanması planlanan anten bilgisayar ortamında üç boyutlu olarak tasarlanmış olup 3D yazıcı yardımıyla PLA (Polilaktik Asit Termoplastik Polyester) malzemesi kullanılarak maketi üretilmiştir. Yapılan çalışma sonucunda elde edilen elektronik dielektrik altlık prototipinin sahip olduğu yüksek dielektrik katsayısı ve üretim teknolojisinin sağladığı değişken dielektrik katman yüksekliği avantajları, mikrodalga haberleşme sistemlerinin yüksek performans ve küçük boyutlu devre tasarımları ihtiyacını karşılayacak bir prototip olduğu görülmüştür.

Anahtar Kelimeler: Alümina, Zirkonya, Şerit Döküm, Elektronik Altlık, Dielektrik Katsayısı

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Computer Simulation of Boronizing Kinetics of TB2 Alloy Using The Integral Diffusion Model

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Abstract

In the current study, the boron diffusion at the surface of TB2 alloy was simulated via a mathematical model based on a numerical solution of the system of differential-algebraic equations (DAE). This kinetic approach allowed us to estimate the values of boron diffusion coefficients in TiB_2 and TiB for an upper boron concentration in TiB equal to 31.10 wt.% at 1223, 1273, 1323 and 1373 K based on the experimental data taken form the literature. The boron activation energies of 151.98 and 99.78 kJ mol^{-1} were respectively evaluated for TiB_2 and TiB and compared with the literature data. Finally, a validation of the present model has been made through a comparison of experimental layers' thicknesses with predicted values. Consequently, the predicted results were in line with the experimental data.

Keywords : Pack-boriding, Titanium borides, Integral diffusion model, Activation Energy.

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Physical, Mechanical, Microstructure and Radiation Attenuation Properties of Boron Concrete Containing Silica Fume

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Abstract

The cement industry is a major energy consumer and a major CO_2 producer. With boron active belite (BA) cement, high strength, low heat of hydration, reduction in CO_2 emissions and significant energy savings are achieved. These factors are at the forefront of the factors that cause this cement to be produced. Colemanite, one of the boron minerals, was used in the production of Boron Cement. Colemanite ore is mainly rich in CaO, SiO_2 and B_2O_3 content. In addition, pozzolanic materials such as silica fume and fly ash are also used as additives in the cement industry. Silica fume is a good source of aluminosilicates because it contains high amounts of alumina and silica.. In this study, mechanical and physical-chemical experiments were carried out on BA cement and Portland composite cement (PC) produced in Göltaş Cement Factory. The performance properties of concretes produced by using PC(CEM I 42,5R), BA and BA+Silicone Fume(SD) as binder material were investigated. As a result of the work done; The strength values of BA+15%SD added mortars were 15.8% and 78.3% higher, respectively, and the heat of hydration was 29.2% lower than BA and 58.7% lower than PC after 180 days of curing compared to BA and PC mortars. Compared to BA and PC concretes, the chloride resistance of BA+SD added concretes improved by 32.3% compared to PC and by 50.4% compared to BA. In addition, the neutron absorption values of Boron and SD added concretes were found to be higher than PC.

Keywords: Boron Belite Cement, Portland Cement, Silica Fume, Hydration, Chlorine penetration resistance.

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Production of Isolation Material From Textile Solid Waste and Determination of Performance Properties

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Abstract

Recycling is the re-incorporation of recyclable waste into the production process by going through various processes. Reuse, on the other hand, is the use of wastes until the end of their economic life, without undergoing any process other than collection and cleaning, while maintaining the mode of production. Recycling and reuse of materials such as iron, steel, copper, paper, plastic, wood, rubber, glass and textile wastes used in the structure of fabricated finished materials will prevent the depletion of underground and surface resources. In addition, raw materials will contribute to the country's economy by reducing import dependency. In addition, environmental pollution will be prevented since the decay cycle of petroleum-derived substances, especially plastic, takes place slowly in nature. With these advantages it provides, recycling and reuse are indispensable phenomena for the continuation of lively life on earth. For this reason, many scientists and manufacturers develop processes for the recycling of raw materials used in the construction of finished materials or create industrial sites for their reuse. In this study; Environmentalist approaches such as large physical and chemical accumulation and degradation of textile solid wastes, recycling and reuse of ideas such as waste management have been ensured. Therefore, it was planned to contribute to the recycling of textile solid wastes by converting them into insulation materials. In the experimental study, heat and sound conductivity values showed better results than the EPS control sample. The most ideal insulation material was produced with the best thermal conductivity values of 0.031 (W/mK).

Keywords: Insulation, textile solid waste, recycling, composite material, new insulation material.

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NiO-Boride Layers Formed on Titanium Ti-6Al-4V Alloy and Their Mechanical Properties

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Abstract

In this study, microstructural and mechanical properties of titanium Ti-6Al-4V biomedical treated alloy were investigated. Ekabor II boriding treatment in titanium Ti-6Al-4V-alloy was achieved for the formation of two-zone of layers on titanium Ti-6Al-4V-alloy and then powder technique treatment with niobium. Optical Microscopy, Scanning Electron Microscope, and X-ray diffraction used to examine the obtained microstructure. It revealed that the titanium alloy treated is composed of α'' lamellar and β phase stabilized by niobium. However, the titanium Ti-6Al-4V alloy is composed of α + β phases. The microstructure contained two-zones, which is differed in phase composition. The outer layer contained niobium (Ti-Nb), while the inner layers contained the mixture of titanium borides (TiB2 and TiB), appearing together with titanium borides. The presence of niobium caused increasing in hardness and Young's modulus of the outer zone in comparison to the sample that did not contain niobium. The average values of indentation Vickers hardness (HV) and Young's modulus (E) obtained were equal to 1728±50 and 190±20 GPa, respectively. Niobium presence has remarkable influence on the mechanical properties of the inner layers TiB_2 and TiB. Moreover, the fracture toughness of the phase composition of the treated area was investigated.

Keywords: Niobium, Ekabor II boriding, titanium Ti-6Al-4V alloy, mechanical properties.

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Investigation on Mechanical and Tribological Characterization of Pure Titanium Borides

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Abstract

Boriding is well known as surface treatment to improve properties of metals that were treated. This study is aimed to form Ti_xB_y on pure titanium and to investigate its wear characteristics. Specimens were borided at 950 ºC for 4 h. Temperature and time are chosen due to previous kinetics study. Optical microscopy, Scanning Electron Microscopy, energy-dispersive x-ray spectroscopy, and x-ray diffraction analyzes were applied to the boride specimens. It was resolute that TiB_2 and TiB borides were formed on the surface with boriding process and the micohardness of these phases increased meaningfully. A hard boride layer was formed on the outer surface. The wear resistance of titanium samples also enhanced by increasing the hardness.

Keywords: wear resistance, Ekabor II boriding, titanium Ti-6Al-4V alloy, mechanical properties.

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Farklı Cam Elyaf Oranlarına Sahip Pom Malzemesinin Digimat ile Karakterizasyonu ve Yataklama Elemanı Üzerindeki Etkisinin İncelenmesi

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Özet

Gelişen teknolojinin beraberinde getirdiği yeni talepler malzemelerin daha sağlam, daha ucuz ve daha hafif gibi özelliklere sahip olması ihtiyacını doğurmuştur. Bu ihtiyaç doğrultusunda yapılan çalışmalar sonucunda ortaya çıkan kompozit malzemeler sürekli bir gelişim halindedir. Malzemelerin ve ürünlerin optimizasyonu için gerekli olan zaman ve maliyet tasarrufunun kritik olduğu bu dönemde en sık kullanılan metotlardan biri sonlu elemanlar analizidir. Bu çalışmada Digimat programı kullanılarak POM (Polioksimetilen) malzemesinin %10, %20 ve %25 cam elyaf katkı oranlarına göre karakterizasyonun ve bu malzemeden üretilen sızdırmazlık elemanlarının davranışının incelenmesi amaçlanmaktadır. Bu amaç doğrultusunda ilk olarak yataklama elemanlarının MSC Marc ile nonlineer analizleri gerçekleştirilmekte, Moldex3D ile plastik enjeksiyon sırasındaki fiber yönelimlerinin tespit edilerek analizlerin çıktıları Digimat ortamında map edilmektedir. Ardından farklı fiber oranlarına sahip malzemeler modellenerek analiz sonucu iç gerilim ve temas kuvvetleri açısından değerlendirilip karşılaştırılmaktadır. Çalışma boyunca sonlu elemanlar metodunun kullanılması gereksiz prototip ve malzeme imalatının önüne geçerek zaman ve maliyet açısından tasarruf sağlamaktadır. Bu çalışma ışığında elde edilen veriler kompozit malzemelerin modellenmesi ve karakterize edilmesi için farklı takviye unsur ve oranları kullanılarak çalışma koşullarına uygun ürün üretimi için ciddi avantaj sağlayacaktır.

Anahtar Kelimeler: POM, Cam Elyaf, Kompozit Malzeme, Digimat, Sonlu Elemanlar Analizi.

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Electrodeposition and Characterization of Ni-Co-Sn Thin Films on SS316 Foils For PEM Fuel Cell Bipolar Plates

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Abstract

Proton exchange membrane (PEM) fuel cells became the center of attention due to their potential high efficiency and environmentally friendly nature. PEM fuel cell is an electrochemical device that consists of several compounds such as catalysts, the membrane, gas diffusion layer, and bipolar plates. Among these compounds, bipolar plates play a vital role in the gas flow and the mechanical stability of the device. Metallic bipolar plates are a promising type of bipolar plate with their high mechanical strength and easy-to-machine properties. Besides that, the availability and the production of metallic bipolar plates are reasonable compared to other types of bipolar plates. Although metallic bipolar plates have some advantages, most of them are lacking chemical stability in the operation conditions of PEM fuel cells. Therefore, to produce low-cost metallic bipolar plates, a protective coating must be applied to the surface of the metallic bipolar plates. These protective coatings are almost all the time necessary for steel-based metallic bipolar plates. In this study, Ni-Co-Sn based thin film coatings had been deposited by electrodeposition technique onto SS316 foils for the PEM fuel cell bipolar plates. A simple sulfate-based electrolyte without any toxic chemicals was used for the electrodeposition of the Ni-Co-Sn layers as a function of direct current density. The electrochemical reduction mechanism of the Ni-Co-Sn system was studied with cyclic voltammetry. The coated samples were investigated with several characterization techniques to understand the influence of direct current density on the properties of the thin film coatings. The structural characterization was held with an X-ray diffractometer, the morphological characterization was performed with the scanning electron microscopy, the composition of the layers was measured with energy dispersive spectroscopy and the hardness of the coatings was measured with a Vickers microhardness device. The electrochemical behavior of the coatings was analyzed with potentiodynamic polarization curves.

Keywords: Electrodeposition, Ni Alloys, Corrosion, Bipolar Plates.

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Evaluation of The Mechanical And Ballistic Properties of Aramid-Based Composite Materials with Graphene Reinforcement

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Abstract

In this research, the main goal is to manufacture high-performance ballistic nanocomposite plates that can be used for personal body armor. For this purpose aramid (kevlar), which has an important place in ballistic fibers were reinforced with graphene which has an extraordinary physical and mechanical characteristics among nanomaterials.
Graphene; thanks to its superior mechanical, thermal and electrical properties, is preferred in the production of lightweight, durable and high-performance composites. There has been increased research on graphene's potential to dissipate the kinetic energy of bullets and stop the progress of bullet in armors. This potential is that graphene can be used in wearable equipment such as helmets and vests used for ballistic protection and the graphene can enhance some properties of these products such as strength, lightness, performance, etc.

In the experimental process, aramid layers in certain sizes were stacked on top of each other and different amounts of graphene nanopowders were applied to certain layers together with epoxy resin. These ballistic plates were pressed under the certain pressure and heat conditons in hydraulic press. In order to determine the correct amount of graphene nanopowders, % 0,5, 1 and 1,5 by weight graphene additive were used with in accordance epoxy resin. Thus, 12 ballistic panels based on aramid, with and without graphene reinforcement were produced.
During the test process, firstly the graphene used in the experimental study was examined in terms of characteristics and as a result of the FTIR (Fourier Transform InfRared) and Raman analyzes, characteristic peaks compatible with the literature related to graphene were obtained.

Secondly, graphene nanopowder reinforced and non-reinforced ballistic plates were exposed to shooting test in the ballistic test laboratory in accordance with the NIJ Standards (U.S National Institute of Justice) which is agreed universally in body armors and the test results were compared. As a result of the shooting tests, successful results were not obtained in ballistic plates reinforced with graphene and epoxy resin, except for one plate and it was evaluated that this was due to the negative effect of epoxy resin on the flexibility and energy

absorption properties of aramid layers. In comparison with bare aramid plates, epoxy resin and graphene nanopowder reinforced plates showed very strict and fragile structure because of infiltration of epoxy resin to the aramid fibers under the high pressure and heat. Different resins or other methods without using resins to combine ballistic fibers and nanoparticles, can enhance the effect of graphene on the ballistic durability. Furthermore energy dissipation mechanisms of composites such as perforation, fiber breakage and delamination, which occur under ballistic effect, were observed and determined in digital photographs of the aforementioned ballistic nanocomposite plates.

Finally these nanocomposite plates were compared in terms of mechanical properties in the last test process. For this purpose, tensile tests were implemented to these bare aramid and different amount of graphene reinforced plates. Ultimate tensile strength (UTS) is defined as the maximum engineering stress level reached in a tensile test, that is, the level of ability of a material to withstand external forces without breaking. As a result of the tensile tests, it was observed that the UTS of the 0,5% and 1% by weight graphene added plates increased up to 82 percent in comparison with bare aramid plates and their mechanical properties improved.

Keywords: Graphene, Nanomaterial, Composite, Ballistic Test, Mechanical Characterization.

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Chiral Diazadioxocalix[2]Arene[2]Triazine-Based Organocatalysts for Enantioselective Michael Reactions

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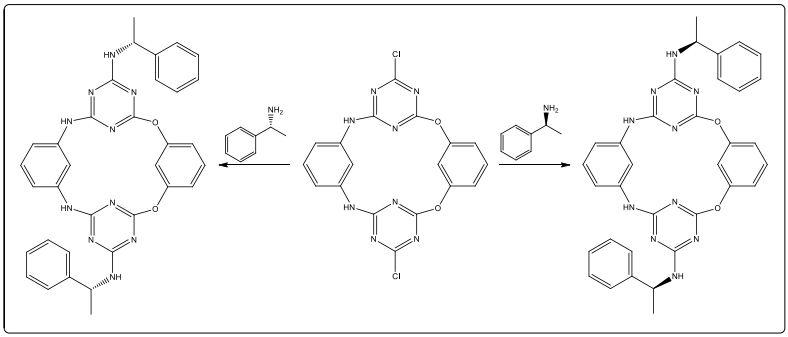
Abstract

Chiral synthesis is an organic synthesis that allows the selective formation of asymmetric compounds. Asymmetric synthesis in organic chemistry is vital in the human/agricultural pharmaceutical industry and the production of nutritional additives. Because in organic chemistry, different enantiomers or diastereomers of a molecule often have other biological activities.



A new diazadioxocalix[2]arene[2]triazine-based organocatalyst was synthesized using both enantiomeric forms of phenylethylamine. This catalyst was used in the enantioselective addition of acetyl acetone to β-nitro styrenes for to determine the catalytic activity. Michael adducts were obtained in excellent yields and enantioselectivities (up to 96% yield and 98% ee).

Keywords: Organocatalysis, Asymmetric synthesis, Diazadioxocalix[2]arene[2]triazine, Stereoselectivity, Michael addition.

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Investigation of the Compression Behavior of Aluminum Sandwich Panels With Viscoelastic Polymeric Foam (RTV-2) Core

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Abstract

Polymeric foam cored sandwich panel structure provides excellent structural efficiency with a high ratio of strength to weight for the design and the construction of lightweight transportation systems. The panel components of these systems are exposed to compression forces under quasi-static conditions. Due to the higher stiffness relative to the deformation rate of viscoelastic material, the polymeric foam cored sandwich panel composite structure highly absorbs the energy from the static loading conditions. In this study, room temperature vulcanized (RTV) polydimethylsiloxane-based polymeric foam core was sandwiched between two aluminum panels. The behavior of these sandwich panel samples with the different thicknesses with different deformation rates under compression force was investigated. During the compression test at increasing speeds, the deformation resistance increased significantly due to the thickness of the polymer foam core material between the sandwich panel. The RTV-based sandwich panel obtained as a result of this study can be used to absorb the energy of the loads that will cause a high deformation rate of the structural elements of the transport systems operating under quasi-static conditions.

Keywords: Aluminum Sandwich Panel, Viscoelasticity, Polymeric Foam, Compression

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The Use of Solar Energy in the Profile of Prefabrication and Its Effect on the Behavior and Durability of Concrete

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Abstract

This research shows the advantage of using solar energy for the hardening of fresh concrete for the prefabricated elements of constructions. An experimental program was carried out to study the effect of the initial hardening time and the environmental conditions, humidity and ambient temperature and inside the stoving chamber on the compressive strength; the water/cement ratio (E/C) is 0.40 for the whole year heated by 2 cycles for both hot and cold periods. The results show the beneficial effect of this type of accelerated hardening and high quality and durability and beneficial for the environment.

Keywords: Solar energy, Prefabricated elements, Hardening, Compressive strength.

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An Experimental Study on the Estimation of the Cohesion Values of Clay-Type Soils According to the Pressuremeter and SPT Site Test Results

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Abstract

In this study, site investigations were carried out on a clayey soil in Espiye district of Giresun city and various in-situ tests including the standard penetration test (SPT) and pressuremeter test were applied for the geotechnical classification. In addition, a series of laboratory studies was performed by using samples taken from the field. The SPT and pressuremeter tests are among the commonly used and popular tests in geotechnical site investigations. There are different approaches in the SPT and pressuremeter tests literature to determine the cohesion values, which can be considered as the most important mechanical parameter for clay type soils. Within this study, the cohesion value of the examined clay-type soil was estimated in accordance with results of the field tests. At the same time, the obtained data was compared with the cohesion values determined in the laboratory tests of the undisturbed samples. According to the findings of this study, it was concluded that the SPT and pressuremeter tests can be used in clayey soils for the estimation of cohesion values. It has been determined that the number of strokes in the SPT test, the limit pressure and the modulus of elasticity measurements in the pressuremeter test are important and useful parameters for the mechanical classification of clayey soils. It is possible to reach accurate results in the characterization of clays, especially by using SPT and pressuremeter test findings together.

Keywords: Site investigations in geotechnical engineering, site tests, clayey soils, pressuremeter test, SPT

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Characterization Studies on Waste Amber-Colored Bottle Glass Collected from Cape Town, South Africa

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Abstract

In this investigation, the waste amber-colored container bottle glass collected from Cape Town, South Africa, street trash box was comprehensively characterized using different techniques. To succeed in this direction, the glass powders were initially obtained by neatly following the washing (water&soap mixture), drying (at 110 0C in an oven), breaking (using a hand-hammer), milling (alumina ball milling), and sieving (under 149 microns) steps. After these processes, the obtained powders were employed in characterization techniques, spectrophotometer (*UV-Vis*), and Archimedes' principle (ρ_{glass}), to understand its physical, including X-ray fluorescence (*XRF*), X-ray diffraction (*XRD*), Fourier transform infrared (*FT IR*), chemical, and optical properties. The *XRF* results showed that the waste glass has a typical chemical composition to that of commercial amber glass. Further, the *XRD* patterns bonding type. On the other hand, the ρ_{glass} equaled 2.5110 g/cm , which has an ordinary value compared to other container glass types. In the context of optical properties, the transmission spectrum revealed a lower percentage for light transmission when compared to a traditional flint soda-lime-silica (SLS) glass. As a result of this study, the authors unveiled a wide range of properties in waste amber-colored container bottle glass.

Keywords: Waste glass, Amber glass, Container glass, Characterization, Waste Management

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2343 Kodlu Çelik Dökümü Sonrası Atık Haline Gelen Hassas Döküm Kumunun Şamot Refrakter Üretiminde Kullanımı

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Özet

Döküm sektöründe önemli bir yere sahip olan hassas dökümün sağladığı büyük avantajların yanında hazırlanan kalıbın tekrar kullanılamaması hem depolama maliyeti hem de çevresel problem oluşturması açısından dezavantajlara sahiptir.
Hassas döküm atık kumuna yapılan x-ışını difraktometre (XRD) analizi sonucu, malzemenin alüminasilikat esaslı olduğu ve seramikler için değerli bir mineral olan zirkon mineralini içerdiği tespit edilmiş ve şamot refrakter tuğla üretiminde kullanılabilirliğinin araştırılmasına karar verilmiştir. Yapılan bu çalışmada, 2343 kodlu çelik dökümünde kullanılan ve atık haline gelen hassas döküm kalıbı toz haline getirilerek %5, %10 ve %20 oranlarında şamot refrakterlere ilave edilmiş, refrakterlerin fiziksel, mekanik ve ısıl şok direnci testleri yapılmıştır. Testler sonucu atık malzemenin içindeki zirkon varlığı ile birlikte mukavemet ve ısıl özelliklerinde iyileşmeler meydana gelmiştir. Üretim sonrası atık girdisinin malzemede yeni bir faz oluşturup oluşturmadığını anlamak adına XRD analizi yapılmıştır. Ayrıca taramalı elektron mikroskobu (SEM) ile malzemelerin mikroyapı analizleri yapılmıştır.
Elde edilen veriler doğrultusunda atık girdisinin şamot refrakter malzeme üretimi için maliyet düşürücü ve aynı zamanda mukavemet ve ısıl özellikleri artırıcı etkisi olduğu gözlenmiştir.

Anahtar Kelimeler: Şamot, Hassas Döküm, Atık, Refrakter, Mekanik Özellikler, Isıl şok.

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Design and Development of Seebeck Coefficient Measurement Setup

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Abstract

The population growth across the globe is in dire need of electrical energy, as our luxurious life and high living standard totally rely on electrical energy. Electrical energy is generated from non-renewable resources. Meanwhile, the combustion cycle is producing waste heat using different sources like industries, vehicles, geothermal operations, solar radiations, generators, etc. This thermal energy in the form of waste heat can be harvested as a renewable source. With the continuously evolving technology and smart materials, there is an increased requirement for thermoelectric materials to power the sensors without a battery. In order to practically apply the discussed knowledge, a Seebeck Coefficient Measurement Setup is designed and fabricated to measure the Seebeck Coefficient of different thermoelectric materials. Design is comprised of a marble block that contains a centre cavity to hold the sample and two holes on two opposite sides of Setup.i.e. Two holes for voltage wires and two holes for thermocouples to measure the temperature difference. This setup harvests the waste heat energy to generate electric current. The Seebeck coefficient of different types of marbles (onyx marble, ziarat white marble, brown marble) was carried out. As well as these marble are also characterized via different characterization techniques like, LCR Meter, SEM (Scanning Electron Microscopy), XRF (X-ray fluorescence spectroscopy).

Keywords: design, development, Seebeck coefficient, marble,

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Formation of Protective Coatings on Magnesium Alloys Based on Predesigned Corrosion Products

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Abstract

Low corrosion resistance in aqueous solutions often hampers the wider applications of magnesium alloys in the aerospace, transportation, civil and biomedical industries. Coating is one of the most effective ways to improve their corrosion resistance. Many methods, including magnetron sputtering and microarc oxidation, have been tried in the last decades. However, it is preferable to find a more cost-effective and facile approach. In our recent studies, we proposed a strategy based on predesigned corrosion for helping Mg alloys against subsequent corrosion by transforming corrosion products into protective coatings. Here, hydrothermal treatment was used to prepare a layer of dense magnesium hydroxide coating on magnesium-aluminum alloys and a simple immersion process was applied to form a layer of uniform $MgHPO_4 \cdot 3H_2O$ coating on magnesium-neodymium alloys. The above results will be described in this invited talk.

Keywords: Magnesium, Corrosion, Surface, Coating.

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The Effect of the Environment on the Development of The Child

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Abstract

The role of the environment in child education and development is very important. The child begins to learn by observing his environment from the first age. Although the child sees his family when he first opens his eyes, he begins to observe what is happening around him later on. The environment provides us with an informal teaching area where we can actively use our five senses. In addition, the environment offers the child an environment of learning by living. He learns a lot about life from the events around him, climate changes, the people and other living things he observes. The environment makes a great contribution to the mental and social development of the child as well as the physical development. Although the influence of the child's environment is sometimes positive, sometimes negative results may occur. Although some individuals think that the environment is more effective on the child, the child receives his first education about life in the family. However, this does not mean that the impact of the environment can be ignored.

Keywords: Environment, Child, Development, interaction

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Cold Sintering of Doped KNN-based Ceramic Composites with Magnetodielectric Properties

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Abstract

The dielectric properties of lead-free dielectric materials have been improved via novel series of (1-2x) $K_{0.5}Na_{0.5}NbO_3$ (KNN)-x$BaTiO_3$ (BTO)-x$BiFeO_3$ (BFO) with the ratios of $0.00 \leq x \geq 0.05$, when fabricated using the Cold-Sintering-Assisted-Sintering (CSAS) method. The transition of phases and the dielectric properties of different proportions of BTO-BFO additives in the KNN-based ceramics are studied using the technique of XRD and measurements of electrical permittivity and dielectric losses as the function of frequency and temperature ranges. The XRD analysis depicts the successful modification in the crystal structure of KNN-BFO-BTO. The orthorhombic peaks of KNN shifted into tetragonal peaks when the BFO-BTO compound was added to it at different percentages. The largest effective relative permittivity (ε_r) was 940 (at 1MHz) at the highest percentage of KNN-BFO-BTO at all sintering temperatures and times. However, when the frequency and temperature change simultaneously, the BFO and BTO favour the electrical properties of KNN and the ε_r increases (~2000 at 1MHz) during dielectric evaluation through LCR Meter. Similarly, the magnetic properties have been evaluated through the VSM and it depicts the maximum coercivity in x=0.05, i.e., 1414.336 Oe. The CSAS method with excessive potassium and sodium provides a transient flow in KNN-based ceramics with functional dielectric properties, depicting a potential way to fabricate a wide range of doped KNN ceramics at low temperatures.

Keywords: Cold sintering; lead-free; magnetic properties; electrical properties

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Determination of Chemical and Radioactive Contamination Levels of Some Herbal Tea

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Abstract

The aim of this study is to examine the levels of chemical and radioactive contamination five herbal teas of echinacea (*Echinacea purpurea*), sage (*Salvia officinalis*), linden (*Flos tiliae*), thyme (*Origanum majorana*) and fennel (*Foeniculum vulgare*), widely consumed and certified grown in Turkey. Specified herbal teas; mineral substances, heavy metals, pesticides and radioactivity were investigated. Herbal teas supplied from Konya; examined by GC-MS, ICP and gamma spectrometry.

In this direction; with the ICP analysis method, a total of 20 minerals and heavy metals were detected including Ge, As, Se, Mo, Cd, Sn, Pb, Na, Mg, Al, P, K, Ca, Cr, Mn, Fe, Co, Ni, Cu and Zn. When examined in terms of pesticides quintozene in sage, dieldrin in echinacea and linden, dieldrin and 2,4 DDE in thyme and methoxychlor in fennel were detected. Radioactivity results were obtained for, Ra^{-226}, Th^{-232}, K^{-40} values for fennel, respectively; 29.219±0.708 (Bq/kg-1), 28.721±0.641 (Bq/kg-1), 104.675±1.774 (Bq/kg-1) for echinacea, respectively; 34.418±0.415 (Bq/kg-1), 26.199±0.595 (Bq/kg-1), 90.123±1.015 (Bq/kg-1). Values for sage; 15,481±0.509 (Bq/kg-1), 16.435±0.520 (Bq/kg-1), 285.159±2.101 (Bq/kg-1) were found. For thyme; 21.254±0.235 (Bq/kg-1), 20.943±0.341 (Bq/kg-1), 100.785±1.584 (Bq/kg-1) and for linden; 10,917±0.134 (Bq/kg-1), 24.697±0.297 (Bq/kg-1), and 252.270±1.995 (Bq/kg-1)was detected.

In this study, certain levels of pesticides, heavy metals and radioactive substances were determined in widely consumed medicinal and aromatic herbal teas. There are few studies on the radioactivity contents of medicinal and aromatic herbal teas, and more studies are needed. It is thought that through food technology and nanotechnology, these contaminations will be minimized and the consumption of herbal teas used for therapeutic purposes will increase in terms of public nutrition and health.

Keywords: Echinacea, Sage, Linden, Thyme, Fennel, herbal teas, heavy metals, pesticide, radioactivity, contamination, nanotechnology.

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Lead-Free Electroceramics and Capacitors for Energy Storage

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Abstract

Materials with high energy/power density are currently needed to meet the growing demand of portable electronics, electric vehicles, and large-scale energy storage devices. High energy densities are commonly achieved for fuel cells, batteries and supercapacitors, but conventional dielectric capacitors are receiving increased attention for pulsed power applications due to their high power density and fast charge-discharge speed. Due to the environmental and health concerns, lead-free electroceramics and capacitors with both high recoverable energy density (W_{rec}) and energy storage efficiency (η) are urgently desired, which are now research hot topics world widely. In this talk, our recent works on several novel lead-free dielectrics and capacitors are introduced, including bismuth ferrite (BF), silver niobite (AN), sodium bismuth titanate (NBT)-based systems, with a focus on energy storage characteristics. Due to the enhanced electric breakdown strength (BDS) and large maximum polarization (P_{max}), high W_{rec} (2.5~8.2 J/cm^3) was achieved across a range of compositions. Multilayer capacitors of optimum compositions possessed ultrahigh W_{rec} of 10~18 J/cm^3 and η of 75~93% with large BDS of 700~1000 kV/cm, which were also temperature/frequency stable and fatigue resistance, and were therefore considered promising candidates for lead-free energy storage applications.

Keywords: Electroceramics; Capacitors; Energy storage; lead-free;

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Coating of Glass Substrate with Photoluminances Powder Added Silicone Polymer

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Abstract

The luminescence feature develops as a result of the effects of foreign substances called activators under different conditions of minerals. It is classified according to the energy source of the luminescence.
The aim of this study is to reduce the contact of glass surfaces with water and to make the glass surfaces glow at night with the additive of photoluminance material. In the study, firstly, strontium aluminate powders were produced and mixed into silicon rubber in different proportions and a thin film was drawn on the glass surface with a film applicator. As a result, a self-luminous and hydrophobic surface was obtained.

Keywords: Luminescence, Polymer, Silicone, Powder.

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State-of-the-Art Review for Fundamental Design Principles in Hydraulic Engineering Perspective: Multiple Outlets Pipelines Hydraulics

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Abstract

Pressurized pipelines with multiple outlets (laterals and manifolds) are extensively used to distribute water in irrigated areas under different types of irrigation systems such as surface, sprinkler, and trickle irrigation submain units. Adequate analysis of hydraulic design of multiple outlets pipeline is very important concern for the proper performance of these systems. Hydraulic design of a multiple outlets pipeline is one of the important factors in the ultimate success or failure of irrigation systems. A multiple outlets pipeline is a hydraulic structure whose design is limited by the operating inlet pressure head, and by water application uniformity that is affected by the total energy loss along the pipeline, the field topography, as well as the outlet hydraulic characteristics. This chapter will review the fundamental concepts and principles upon which the hydraulics of multioutlets pipeline systems is based. The review is intended to be sufficiently complete that readers who have taken a good first course in elementary multioutlet pipe flow hydraulics, various design concepts with engineering applications in profession, covering different types of pipe design problems that are the foundation of the material in this book. We will begin with an introduction to the fundamental equations that are the foundation of most of the subsequent developments in the book. Because the concept of the Energy Grade Line (EGL) and the Hydraulic Grade Line (HGL) is so useful, we shall look at this idea separately. The chapter will conclude the governing equations for steady-state pipe flow that will allow readers to better understand the later analytical derivations for the coming chapters.

Keywords: Steady-state analysis, turbulent flow, friction coefficient, Reynolds number, hydraulic-grade line (HGL), energy-grade line (EGL).

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Hydraulic Assessment for Commercial Pipeline Design with Considering Local Energy Losses Using Mathcad Procedure

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Abstract

The paper presents a design procedure improved by using power law friction factor, which provides accurate solutions for three types of pipe design problems (Types A, B and C) with considering effect of local losses. The parameters introduced in the power law are related with the type and size of commercial pipes, thus several dimensionless physical numbers by a suitable combination of the variables for the solution of Type B and Type C problems, are also introduced. For solution of the general case of a Type B problem (sloping pipe with pumping power), user-friendly the *MathCAD* procedure, which produces a consistent framework for analyzing and solving common piping-system applications, was also carried out. In order to prove degree of accuracy of the present technique, several design examples are examined for three types of commercial pipes, and for a wide range of uniform pipe slope, and the results are shown in the design curves. The curves employed have practical importance to quickly determine the values of required variables for a given pipe slope. The present technique gives an opportunity to compare the results of the proposed method with those of obtained from the existent literature, in profession practice.

Keywords: water distribution networks; pipeline design; commercial pipes; pipe hydraulics; pressurized flows; steady-state analysis; software; Math*CAD*.

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Variation of Design Parameters in Micro-Irrigation System Subunit Laterals by Using Dimensionless Design Curves

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Abstract

Micro-irrigation system laterals deliver irrigation water to the plant root zones through emitters in a micro-irrigation (drip, trickle) system. Adequate analysis of micro-irrigation system laterals is very important for the design and evaluation of micro-irrigation systems. Design of a lateral pipe includes the determination of the pipe length or the inside diameter, the required operating inlet pressure head and total friction head losses along the lateral assuming that the total flow rate at the inlet, characteristic of the emitter, and the acceptable level of uniformity are known previously. In this study, the forward-step method (FSM) that takes into account to the velocity head change and variation of the Reynolds number, which affects the selection of the proper friction coefficient formula to be applied along the different reaches of the lateral pipes was presented, and then, a computer program in Visual Basic 6.0 language named Multi-flowCAD was provided for analyzing and designing of micro-irrigation laterals. This method has the highest accuracy because only the basic equations of the hydraulics of steady pipe flow were used. In this study, variation of the operating inlet pressure head, total friction head losses and uniformity coefficients depend on the pipe lengths ranging between 25 and 250 m and the internal diameters ranging between 10 and 21 mm in zero slope condition were evaluated graphically in dimensionless form for practical purposes. These presented figures could also be used as the design charts. The results of computer program based on the forward-step method are in close agreement to those obtained by other researchers.

Keywords: Irrigation system, Micro-irrigation, Drip (Trickle) irrigation, Low-volume irrigation, Laterals, Smooth pipe flow, Lateral hydraulics, Emitters, Uniformity coefficient, Pipeline network.

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Total Energy Loss Assessment for Trickle Lateral Lines Equipped with Integrated in-line and on-line Emitters

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Abstract

Accurate estimation of trickle (drip) irrigation lateral head loss requires calculation of the combined friction loss from pipe and emitters. In routine calculations of total energy loss minor losses are generally neglected. However, experimental studies have shown that minor losses can be a significant percentage of total energy loss, especially in the case of closely spaced emitters. In this study, simple mathematical expressions for computing three energy loss components -minor friction losses through the path of an integrated in-line emitter, the local pressure losses due to barbed emitter connections, and the pipe friction loss- are calculated with the backward stepwise procedure. These expressions are implemented in a simple Excel spreadsheet to evaluate the relative contribution of each energy loss component. A combination calculation procedure is then used to calculate total energy loss. As an example, two sample designs were evaluated in order to show the relative magnitudes of total friction loss (due to pipe and emitters) emitter local losses, and pipe friction loss for two kinds of the integrated in-line emitters with varying spacing. A comparison test covering two design applications for different kinds of integrated in-line and on-line emitters revealed that the present mathematical model is simple, practical, and sufficiently accurate in all design cases examined.

Keywords: Water pipelines, Trickle (drip) laterals, Emitters, Energy (Head) loss, Friction, Analysis.

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A Response Surface Study on Effects of Additive Rate and Process Parameters on Surface Quality in Powder Mixed EDM of Crcomo

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Abstract

Due to the high mechanical strength of the metals used in implant manufacture, which makes them difficult to work with using other machining techniques, EDM is frequently employed in the production of implants. In this study, the effect of powder ratio and other EDM parameters used in the machining of CrCoMo alloy, which used in implant production widely, with powder added EDM on the surface roughness of the machined part was investigated through the response surface methodology. AISI 316L stainless steel was chosen as the electrode material, and Ti6V4Al was chosen as the additive powder, taking into account its biocompatibility properties. Using a Taguchi L_{16} array, an experimental design was created by selecting 4 levels for the parameters of dust ratio, discharge current, T_{on}, and T_{of}. The response surface method was used, along with the experimental data, to estimate how the parameters affected R_a and R_z.

Keywords: EDM, RSM, PM-EDM, CrCoMo.

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Küresel Yapıda Grafitik Karbon Sentezi ve Karakterizasyonu

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Özet

Sanayi tesisleri, araçlardaki egzoz emisyonu, temizlik malzemeleri, kimyasal proses ve malzeme üretimleri sonucu yayılan ve havada kirletici olarak bulunan Uçucu Organik Bileşikler'in (VOC) giderilmesine yönelik adsorban geliştirme çalışmaları son yıllarda önemini sürdürerek devam etmektedir. Bu kapsamda VOC adsorplayıcı malzeme olarak karbon türevi malzemeler sıklıkla kullanılmaktadır. Bu çalışmada, küresel polimerik aktif karbon (PAK) sentezi ve VOC'lerin adsorplanmasında kullanılan pasif örnekleyici adsorban olan Grafitik Karbon üretim çalışmaları yapılmıştır.

Başlangıçta süspansiyon polimerizasyonu yöntemiyle çapraz bağlı polimerik kürecikler sentezlenmiştir. Elde edilen polimerik kürecikler 700 °C'ye kadar karbonize edilmiş ve sonrasında 830 °C'de su buharı ile aktive edilerek küresel PAK üretimi yapılmıştır. Bu yöntemle üretilen PAK'ın BET cihazı ile yüzey alanı ve ortalama gözenek çapı ölçüldüğünde sırasıyla 2027 m^2/g ve 1,232 nm olduğu tespit edilmiştir. Aynı PAK'ın SEM cihazı ile mikro yapı incelemeleri ve RAMAN mikroskop cihazı ile kimyasal yapı karakterizasyon çalışmaları yapılmıştır. Tüm bu karakterizasyon çalışmaları sonucunda üretilen PAK'ın istenilen özelliklerde yani küresel yapılı, sert ve homojen mikro gözenek dağılımına sahip olduğu tespit edilmiştir.

İkinci aşamada PAK'tan 1700 °C'de 10 L/dk Argon akış hızında, 30 saat boyunca atmosferik basınç (GPAK1) ve inert 20 mbar vakum (GPAK2) altında grafitizasyon çalışmaları yapılmıştır. Buna göre vakum altında üretilen GPAK2'nin yüzey alanının (1394 m^2/g), atmosferik ortamda yapılan GPAK1'in yüzey alanına (1787 m^2/g) göre daha düşük olduğu görülmüştür. Bu duruma örneklerde grafitizasyon sonucu bazı gözeneklerin kaplanarak yok olması ve bazı gözeneklerin mikro gözeneğe dönüşmesi neden olduğu söylenebilir. Ayrıca aynı ürünler için yapılan SEM ve Raman karakterizasyon sonuçlarına göre de GPAK2 ürünün, GPAK1 ürününe göre daha düzenli bir yapı sergilediği ve G bandı genişliğine göre daha yüksek grafitizasyona uğradığı görülmüştür.

Anahtar Kelimeler: Küresel Polimerik Aktif Karbon, Grafitizasyon, Grafitik Karbon, BET, RAMAN, SEM.

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About Intelligent Software System and Development Method for the Intelligent Interface

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Abstract

An intelligent software system refers to any software using artificial intelligence to analyze and interpret data or to communicate with systems and people. The article substantiates the relevance of the issue and highlights existing problems. The following factors are taken into consideration when assessing the problems of intelligent software system designing: easy data collection, low cost of developing intelligent systems, availability of experts and necessary resources (computers, program developers, software, etc.).
A model is developed for the intelligent interface. The competency of the expert group is formed and evaluated, and experiments are conducted. The results obtained are satisfactory. The developed method can be beneficial for everyone.

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Requirements for Specialists in the Industry 4.0 Environment: Problems and Solutions

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Abstract

The new industrial revolution is changing human life and activities beyond recognition. Artificial intelligence, robotics, internet of things, 3D printing, nanotechnologies, quantum computing, big data – these are all technological realities that form the basis of the fourth industrial revolution. These technologies are designed to provide humanity with everything it needs, including ensuring the security of the individual, society and the state.The development of digital technologies, the application of cyber-physical systems and the use of artificial intelligence lead to an increase in the standard of living of certain groups of the population, and economic growth in several areas of the economy. At the same time, it brings a number of problems.

The application of digital technologies leads to job losses. According to the forecast of the World Economic Forum, millions of people in several countries of the world will face the threat of losing their jobs as a result of the application of robots in the future. An important condition for ensuring competitive activity of the enterprise in the environment of Industry 4.0 is human capital - training of qualified personnel with digital skills. On the other hand, the content of the most required skills and habits has changed significantly in recent years, and new training methods have appeared. This requires constant updating of programs designed for personnel training and skill development. Application of cyber-physical systems in industrial enterprises, management of production processes and other processes with computer programs requires ensuring high level of cyber security. Currently, in the modern digital world, cybercrime is the main threat factor for the development of the world economy. Previously, there was an opinion that strong software development and technical methods were sufficient to prevent unauthorized access to information resources. However, it is not possible to ensure information security only with software and technical means. The solution of information security problems also depends on the culture of people and their behavior in relation to information.

Research shows that the majority of security breaches are caused by human error. Therefore, enterprises should prepare their employees in a better way in order to increase the level of information security of their resources and increase the resistance of employees to cyber threats. The article examines the advantages and disadvantages of the application of digital

technologies in the industry 4.0 environment, the problems that arise, and ways to overcome these problems. Existing approaches for defining a list of new skills and habits in terms of the requirements for specialists now and in the near future are analyzed and summarized. Suggestions and recommendations are given for developing these skills and habits.

Keywords : Industry 4.0, information security, digital competences, information security culture, personnel development

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Functionalization of Natural Polymers for Their Biomedical and Environmental Applications

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Abstract

Natural polymers, especially cellulose and chitin have drawn tremendous research attention for various biomedical and environmental applications due to their abundance availability, sustainability, biodegradability, and biocompatibility. Despite those merits, their direct applications are often limited mainly due to the insolubility in most solvents. Herein, chemical modifications, involving primary amine group of chitin/chitosan and hydroxyl groups of cellulose, are highlighted to improve the solubility as well as to impart novel functionalities of the molecules for targeted applications. Those modified materials were characterizations using various analytical tools *e.g.* Infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR), x-ray diffraction (XRD), scanning electron microscopy (SEM) and rheology.

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Surface Functionalization of Boron Carbide Nanoparticles and Their Potential Assessment Use as a Carrier in Boron Neutron Capture Therapy (BNCT)

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Abstract

Boron neutron capture therapy (BNCT) is a method of radiotherapy binary, consisting in the selective supply of boron (^{10}B) into cancer cells and then irradiating the affected area with a beam of epithermal neutrons. Therapy depends on the "introduction" of boron compounds into tumor cells and then irradiating them with low energy epithermal neutrons.
The approach proposed in the project aims to synthesize and functionalize spherical nanoparticles boron carbide as a carrier for delivering a boron-rich compound to the tumor environment. Boron carbide was obtained by direct synthesis from elements. The use of polysaccharides of diverse branching: dextrins, hydroxyethyl starch (HES), chitosan and dextrans (which are glucose polymers) is associated with the presence of carboxyl groups (COOH), which can be chemisorbed join the B-O and B-OH bonds. The conducted experiment confirmed that the surface of boron carbide nanoparticles can be modified with the use of appropriate polysaccharides. The obtained results show, however, that the degree of functionalization differs depending on the type of sugar or amino acid with which the modification was carried out.
Functionalization of the B_4C surface with sugars will allow for further modifications, e.g. combination of nanopowder with specific antibodies and selected enabling ligands delivery of the carrier to tumor cells.

Keywords: Boron Carbide (B_4C), Surface functionalization, Boron Neutron Capture Therapy (BNCT), Keywords4.

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Pressureless and Laser Sintering in Milling Time Function of Boron Carbide

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Abstract

This paper concerns characterization of boron carbide powder after various milling time from 0 to 16h which was performed by rotary-vibratory mill using WC-Co balls in alcohol environment. The milled powder was analyzed by means of density, phase composition, morphology and particle size distribution. The influence boron carbide milling time on pressureless sintering was determined by dilatometric measurements. WC contamination impact on the onset and end sintering temperature was examined. The sintered samples were subjected into phase composition (XRD) analysis and influence of initial powder preparation process on sinters' microstructure was studied (SEM/EDS). XRD measurements confirmed formation of tungsten boride phase in obtained sinters with increasing content related to boron carbide milling time. WC contamination influence on the laser sintering process of boron carbide was studied. The polycrystals were analyzed for quantitative phase composition, microstructure and tungsten element distribution. The liquid phase formation during laser sintering process was noticed which confirmed liquid phase sintering type in higher temperatures during dilatometric measurements. The preparation way of initial powder on bimodal polycrystalline boron carbide microstructure appearance was discussed.

Keywords: boron carbide, tungsten carbide, tungsten boride, pressureless sintering, laser sintering

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Functional Metal Oxide Surfaces: Photocatalytic, Self-Cleaning, Sensing, and Micro-/Nanostructuring Applications

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Abstract

Titanium oxide (TiO_2) is one of the most used photocatalytic materials for various applications such as environmental remediation, (solar)water splitting, and self-cleaning due to its high activity, low cost, high chemical, and physical stability. However, the photocatalytic activity of TiO_2 is limited by the wide energy of the bandgap, low quantum efficiency, and rapid recombination of photogenerated charge carriers (electrons and holes). During the last decades, numerous approaches, such as tailoring the morphology (nanoparticles, thin film, etc.), combining with metal, noble metal, and metal oxide micro/nanostructures, have been demonstrated to enhance the photocatalytic activity of TiO_2. However, it is still a major challenge to find the best photocatalytic combination for specific applications. Recent studies have revealed that particle size plays a considerable role in the photocatalytic activity of TiO_2. Reducing the particle size (increasing active surface area) indicates a higher photocatalytic activity. Nevertheless, the use of photocatalytic nanoparticles in continuous flow systems (such as water remediation, water splitting, etc.) has some practical limitations such as reusing and splitting them up from the reaction media. Hence, the use of robust and stable thin film photocatalysts becomes more suitable rather than nanoparticle systems for practical applications. Nevertheless, thin films are restricted by low surface area in contrast to nanoparticles and they show extremely limited photocatalytic activity. Here we present some case studies on enhancing the photocatalytic performance of TiO_2 thin film by modification with metallic [1-3] and oxide [4-5] nanostructures for practical applications such as water purification, self-cleaning and selective oil absorption.

Keywords: metal oxide, functional surfaces, photocatalysis, self-cleaning, nanostructuring.

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Microwave Energy-based Hybrid Nanomaterial Preparation and Its Characterization for Energy Storage Applications

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Abstract

A promising hybrid nanomaterial (HNM), composed of carbonized conducting polymer (cCP), e.g., polypyrrole (PPy), nanoparticles (NPs) with simultaneously grown carbon nanotube (CNT) and metal oxide nanowire (MONW) coverage on its surface was prepared for electrochemical energy storage purposes. To prepare this novel HNM and to overcome the common challenges in other conventional synthesis methods, a simple and straightforward *in situ* polymerization/coating approach was systematically combined with the modified version of a well-established, facile, and rapid *ex situ* microwave (MW) energy-based approach, i.e., PopTube. This highly efficient and easily scalable combined approach has effectively managed to produce the targeted HNM in an affordable manner, and with unique morphological (SEM/TEM), elemental (EDX), spectroscopic (XRD, Raman) and electrochemical (CV) features, all of which are strongly supported by both material characterization test results and the relevant literature data. Thus, it is believed that the as-prepared CNT and MONW decorated cPPy NP-based HNM through this combined approach would soon become a preferred material for the above-mentioned purposes with respect to its promising features.

Keywords: carbon nanotube, conducting polymer, electrochemical energy storage, metal oxide nanowire, microwave energy.

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Alternative Polypropylene Fiber Additive Concrete with Portland Cement

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Abstract

In this study, polypropylene fiber mixtures were prepared and polypropylene fiber and superplasticizer used as an additive were added in the concrete. Polypropylene fibers are produced from isotactic polypropylene. Their thickness varies between 50 microns and 100 microns. The filamentous fiber is used as a layer. It shows melting property at 165 ºC, but the material can maintain its own property up to 100 ºC. Generally, 0.3-1.5% is preferred in concrete mortars.The water absorption, density and unit weight values of the obtained samples were investigated for the hardened concrete.

Keywords: Polypropylene, Concrete, Water absorption, Density, Unit weight

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Development of a New Insulation Material in the Construction Industry

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Abstract

In this study; Environmentalist approaches such as large physical and chemical accumulation and degradation of textile solid wastes, recycling and reuse of ideas such as waste management have been ensured. Therefore, it was planned to contribute to the recycling of textile solid wastes by converting them into insulation materials. In the experimental study, heat and sound conductivity values showed better results than the EPS control sample. The most ideal insulation material was produced with the best thermal conductivity values of 0.031 (W/mK).

Keywords: EPS, XPS, recycling, composite material, insulation material.

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Investigation Physicomechanical Properties of Boron Cement Mortars

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Abstract

In this study, mechanical and physical experiments are carried out on Boron cement and Portland composite (PC) cement produced in Göltaş Cement Plant (Isparta, Turkey). The performances of concretes manufactured by using PC (CEM I 42,5R) and Boron cement as binding material are investigated. As a result of the studies performed, the compressive strength of the mortars with BA and PC mortars at the end of 28 days of curing, respectively, and the hydration heat is 8.7% lower than BA and 82% lower than PC.

Keywords: Boron cement, Compressive strength, Hydration, Portland cement.

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Physical properties of mineral-added concretes

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Abstract

Colemanite, one of the boron minerals, was used in the production of Boron Cement. In this study, physical experiments was carried out on Portland composite cement (PC) produced in Göltaş Cement Factory. The performance properties of concretes produced by using PC(CEM I 42,5R) and mineral added cement as binder material were investigated. As a result of the work done; Heat of hydration, unit weight, permeability, and water absorption values of the concrete with additives were investigated. The physical properties of portland cement and mineral-added mortars were compared.

Keywords: Boron, Portland Cement, Hydration, permeability.

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Synthetic Libethenite Cu_2PO_4OH – Olivenite Cu_2AsO_4OH Solid Solution Photocatalysts – Spectroscopic Study

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Abstract

Copper hydroxyphosphates and hydroxyarsenates have attracted attention due to their applications in catalysis and intercalation chemistry. In particular, Cu_2PO_4OH (libethenite) and Cu_2AsO_4OH (olivenite) have been reported as effective photocatalysts. Seven compounds of the libethenite Cu_2PO_4OH – olivenite Cu_2AsO_4OH (LIB–OLI) solid solution series were synthesized at 70ºC from aqueous solutions. In the experiments on the catalytic degradation of methylene blue by visible light the $Cu_2(PO_4)_{0.5}(AsO_4)_{0.5}OH$ intermittent member of solid solution series showed much better photocatalytic properties than the endmembers. To better understand the effect of As substitution for P on catalytic properties, the material was characterized by FTIR and Raman spectroscopy. The substitution results in change in the position and intensity of bands derived from phosphates, arsenates and hydroxyl ions. The position shifts toward lower wavenumbers with substitution of $(AsO_4)^{3-}$ for $(PO_4)^{3-}$. The main Raman bands attributed to phosphates stretching and bending vibrations shift between 1052 – 1020 cm^{-1} and 976 – 855 cm^{-1} while bending vibrations of arsenates appear at 976 – 818 cm^{-1}. The OH band shifts from 3476 cm^{-1} in LIB to 3438 cm^{-1} in OLI. A similar effect is observed for the main FTIR bands. The bands attributed to stretching and bending vibrations appear at 1083 – 963 cm^{-1}, 648 – 553 cm^{-1} and 445 – 518 cm^{-1} for phosphates and at 950 – 791 cm^{-1} and 441 – 541 cm^{-1} for arsenates. The OH band shifts from 3478 to 3438 cm^{-1} in LIB-OLI. The effect is not linear for OH bands. These shifts are not only due to the effect of a higher atomic mass of As than P but also from the decreasing bond strength. Catalytic properties of this material originate from the OH group attached to the Cu sites which act as adsorption sites on the catalyst surface. The spectroscopic characterization indicates that the enhanced photocatalytic properties of the intermediate member of the LIB-OLI solid solution series may result from the higher reactivity of the OH group weaker bound to the structure.
This research was funded by NCN research grant no. 2021/41/N/ST10/03566

Keywords : libethenite , olivenite, FTIR spectroscopy, Raman spectroscopy.

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Structural and Chemical Characterisation of Pulsed Electrodeposited Layers Based on Aluminum Oxide

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Abstract

The aim of this research was to optimize the parameters of pulsed electrophoretic deposition process of aluminum oxide coatings on steel substrates and providing a chemical and structural characterization. Electrophoretic deposition is a process based on depositing electrically charged particles dispersed in a colloidal suspension on a conductive substrate under use of electrical field. Unfortunately, some undesirable phenomena may happen during the process such as water electrolysis, which may negatively affect the texture of obtained layer. The use of PC-EPD (Pulsed Current Electrophoretic deposition) is one of the method of elimination of undesirable hydrolysis process during the application of coatings. In a research, aluminum coating were applied using DC-EPD (Direct Current Electrophoretic deposition) and PC-EPD method. In order to characterize prepared layers, textural (confocal microscopy, profilometry) and microscopic (SEM) studies were performed. In addition in order to confirm aluminum oxide deposition structural (DRS,FTIR) studies were provided. Contact angle was tested indicating the hydrophilic nature of the layers. The comparison of deposition parameters between layers deposited using DC-EPD and PC-EPD is presented. The conducted research allowed to determine the most optimal conditions for pulsed electrodeposition of homogeneous aluminum oxide layers.

Keywords: Aluminum oxide, DC-EPD, electrophoresis

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Effect of Dams on Social Life in Sudan

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Abstract

Sudan has large water resources and irrigation infrastructure. Since the Nile river passes through the territory of the country, irrigation projects for irrigated agriculture started with the establishment of the first pump in the Zeydeb agricultural project in 1906, and irrigation infrastructure was created with the start of the "island" project in 1925. In 1925, the construction of dams and water channels was completed with the Gezira project. After Sudan's independence in 1956, the agricultural sector developed with the increase in irrigated areas. In 1959, the Nile Water Agreement was signed between Egypt and Sudan, in which the Rosiris and Khashm al-Qarba canals were built to expand Sudan's irrigation network. With this agreement, hydroelectric power plants were established in order to supply electricity to the country

Keywords: Sudan, Water resources, Dam, Hydroelectric power.

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The Development of Buildings and Their Impact on the Shape of Social Life in Sudan

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Abstract

Old buildings in the city of Khartoum reflect some of today's building designs to benefit from the sun's rays. In building materials; There are traditional mud houses that use eco-friendly materials and wood in the ceilings. This creates an environment suitable for the climatic conditions of Khartoum, a city with a semi-desert climate where temperatures rise. The presence of such models covers about 60% of the energy consumption for heating the house in most countries and warm regions.

Today, it is seen that the buildings made of cement and iron with the modern construction method are increasing day by day in the capital Khartoum. This situation also increases the need for energy (lighting, electrical appliances, hot water, etc.). With the increase in concretization, temperature increases are observed in the areas around these buildings. Because concrete absorbs the sun's rays during the day and releases them at night. These modern houses, which have become symbols of social status with the economic progress in Sudanese society, are ready-made imported models. These models cause more electricity consumption due to the high numbe.

Keywords: Sudan, Building, social life, Mud houses.

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The Effect of Climate Change on Sudan

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Abstract

Sudan is generally a country with windy and cold winters and hot and rainy summers. The climate of the country; While there are regions that do not rain in the north of the country, there are regions that receive heavy rain in the southern parts. With the global climate change, these climatic conditions have become even more evident. The temperature in summer varies between 35-40C throughout the country. During the winter months, these temperature values decrease up to 12 °C. The effect of desert and wind plays a decisive role on temperature and climate.

Keywords: Sudan, Climate, Temperature, Weather variation.

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SEM'lerde Kullanılan İleri Karakterizasyon Teknikleri

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Özet

Genel olarak SEM'lerde, topografik (SE), kompozisyon (BSE) ve elementel analiz (EDS) dedektörleri yaygın bir şekilde kullanılmaktadır. Bu dedektörlerin dışında, SEM'e entegre edilen diğer dedektörler, spektrometreler ve aksesuarlar da günümüzde gittikçe artan oranlarda kullanımda yer bulmaktadır. Sunum sırasında ileri karakterizasyon tekniklerinde kullanılan bazı donanımlar ve bunlar ile ilgili uygulamalar verilecektir. Özellikle, RISE (Raman Imaging Scanning Electron), TIMA (Minerology & Petrography), EBSD (Electron Back Scattered Diffraction), CL (Cathodoluminescence), STEM (Scanning Transmission Electron Microscope), KATANA (Ultra Microtome in SEM), FIB-SEM (Focused Ion Beam-Scanning Electron Microscope), ToF-SIMS (Time of Flight-Secondary Ion Mass Spectrometer), AFM (Atomic Force Microscopy in SEM) üzerinde durulacaktır. Ayrıca Cryo-SEM, Cooling Stage, Tensile Stage, Nanoindentor ve Nanomanipulator gibi eklentiler de çeşitli uygulamalarda kullanılmaktadır.

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Mechanical Properties and Adhesion of AlCrN Coating Deposited onto a Gas Nitrided Substrate

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Abstract

In this study, aluminium chromium nitride (AlCrN) and iron nitrides (Fe_xN) layers were formed on the surface of AISI 4140 steel through the cathodic arc PVD and gas nitriding processes, respectively. Three systems were evaluated by mechanical and adhesion tests: AlCrN monolayer coating [AlCrN], duplex coating formed by AlCrN onto an iron nitrides interlayer [AlCrN/ Fe_xN] and only nitrided substrate [Fe_xN]. The physicochemical characterization was performed by scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS) and X-ray diffraction (XRD). The AlCrN coatings thicknesses were 2.2 and 3 μm for AlCrN and AlCrN/Fe_xN, respectively; whereas for Fe_xN it was 10 μm. The mechanical properties were obtained by Berkovich instrumented indentation tests up to a maximum linear load of 20 mN. An average hardness of 35 GPa was determined for AlCrN and 38 GPa for AlCrN/Fe_xN, meanwhile 10 GPa for Fe_xN. Moreover, the adhesion of the coatings was evaluated in accordance with the VDI 3198 norm. The AlCrN/Fe_xN coating presented the best adhesion. In conclusion, the AlCrN/Fe_xN duplex coating exhibited better behaviour under same testing conditions as compared with the AlCrN and Fe_xN coatings, due to the presence of the iron nitrides interlayer.

Keywords: AlCrN; nitriding; duplex coating; mechanical properties; adhesion.

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Production of Strontium Aluminate-Based Phosphorescence Materials by Sol-Gel Process

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Abstract

Luminescence is the emission of some of the energy received by any object from an external source as electromagnetic radiation. After the light source is removed, the resulting glow is called fluorescence if the glow stops, and phosphorescence if the glow continues. Although the phosphors obtained with radioactive (Pm-147) elements added to strengthen the phosphorescent effect show long irradiation times, they offer a limited area of use when health and environmental conditions are considered. For this reason, thanks to the studies carried out to develop new products, Strontium Aluminate systems with high efficiency have been obtained. In this study, it was aimed to produce Strontium Aluminate Dy-Eu doped phosphorescence powder.

Keywords: Strontium aluminate, luminescence, rare earth elements.

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TTB-based $Ba_2K_2Gd_3Fe_5O_{15}$ Electroceramic with Sodium (Na) as a Dopant for Capacitors: Electrical and Magnetic Properties

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Abstract

Dielectric capacitors are drawing a lot of interest for better-pulsed power due to their quick charge and discharge rates and high-power density. Energy density does have a limit, and efficiency and thermal stability are also not ideal. This has long been a barrier to the creation of appealing dielectric materials. In general, instead of lead-based piezoelectric ceramics, which are toxic and not environmentally friendly, capacitors are now made of polymers and ceramics because they provide the best combination of capacitance, dielectric loss, breakdown strength (BDS), and thermal stability. At room temperature, polymer dielectric capacitors have a high power/energy density, but at temperatures beyond 100 °C, they are unreliable and prone to dielectric failure. As a result, dielectric ceramics are the sole viable solution for high-temperature applications. In this research paper, solid-state synthesis was used to create $Ba_2K_2Gd_3Fe_5O_{15}$ and $Ba_2K_{(2-x)}Na_xGd_3Fe_5O_{15}$ Tetragonal Tungsten Bronze (TTB) based lead-free high-density ceramics with Sodium (Na) as a dopant in varying fractions (x = 0.25, 0.5, 0.75, and 1.0). The stoichiometric powder was first dried in a furnace, mixed with ethanol, and ground for 1 hour in a ball mill. Followed by calcination at 800 °C for 2 hours. The mixture was milled again and particle size analysis was performed. The powder was then compacted and next the ceramic tablets were sintered at 1050 °C for 2 hours, followed by polishing to the required thickness, and surfaces were covered with silver paste before being fired, and electric and magnetic properties were studied.

Keywords: Dielectric Capacitors, Piezoelectric, Tetragonal Tungsten Bronze (TTB), Sintering

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Structure and Dielectric Properties of TTB-Based $Ba_2Na_2Gd_3Fe_5O_{15}$ Electroceramic with Potassium (K) as a Dopant for Energy Storage Applications

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Abstract

Lead-based piezoelectric ceramics are strong candidates in terms of excellent piezoelectric properties. However, due to the toxic nature of lead compounds, the development of environmentally friendly lead-free materials is now being considered as a potential alternative. In addition, there is a strong effort to develop temperature-stable dielectric ceramics that can operate at temperatures around 200◦C, which is well above the limit of existing high volume efficiency capacitive materials. To investigate the effect of structural, and transport properties, compositions of $Ba_2Na_2Gd_3Fe_5O_{15}$ and $Ba_2Na_{(2-x)}K_xGd_3Fe_5O_{15}$ Tetragonal Tungsten Bronze (TTB) based lead-free high-density ceramics were produced by solid state synthesis with Potassium (K) as a dopant in varying fractions (x = 0.25, 0.5, 0.75 and 1.0). High purity ceramic oxide powders were dried in a furnace, mixed with ethanol and grounded for 1 hour in ball mill to obtain a homogenous mixture. Followed by calcination at 800°C for 2 hours to achieve a more homogenous combination. The mixture was milled again and particle size analysis were be performed. The ceramics were then well sintered to a dense structure at 1000 °C for 4 hours and electric and magnetic properties were studied.

Keywords: Piezoelectric, Electroceramics, Dielectric, Tetragonal Tungsten Bronze (TTB)

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Improvements in Characterization of Pozzolanic Cement Mortars After Hybrid Grinding Method

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Abstract

Mechanical activation can induce the pozzolanic reaction by causing significant physical and chemical changes in minerals and mine tailings. Although diabase is a volcanic rock, it has a low pozzolanic content. In this study, a roller press equipment is integrated before the ball mill. In the hybrid grinding system, diabase rock was subjected to mechanical activation for the first time. As a result of mechanical grinding the diabase rock in a single type ball mill, it was observed that the mechanical activation duration, which lasted for 60 minutes, was reduced to 30 minutes after the hybrid grinding system. Structural and morphological changes were examined by taking SEM images of diabase powder particles before and after mechanical activation, and it was observed that significant pozzolanic activity was obtained in diabase after hybrid activation. In the hybrid grinding method, although the grinding time decreases, the specific surface area tends to decrease, but due to the dehydroxylation reaction caused by the mechanical activation, it led to a gradual decrease in the relative crystallinity and an increase in the pozzolanic activity index. With the mechanical activated diabse obtained by a hybrid grinding method, cement mortars from 10% to 50% were produced and the hydraulic, mechanical and microstructure properties of the mortars were investigated. The mechanically activated diabase exhibited a high capacity to react with calcium hydroxide to form calcium silicate hydrate, which is typical of pozzolana.

Anahtar Kelimeler: Diabase, Cement, Hybrid grinding, Pozzolanic activity, Hydration properties.

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Self-Cleaning Hydrophobic Coating on Solar Glass

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Abstract

In this study, the coating solution was prepared by mixing tetraethoxysilane (TEOS), hexamethyldisilazane (HMDS), ethyl alcohol, zinc acetate, pure water mixture for 3 hours in a magnetic stirrer. The prepared solution was coated on the solar panel glass surface in one layer and two layers by spray coating method. Heat treatment was applied to the coated solar panel glasses in an oven at 80ºC for 1 hour. After the heat treatment, the contact angle measurements of the coated surfaces with the goniometer were made and the results were examined..

Keywords: Solar glass, Hydrophobic coating, Self-cleaning.

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Preliminary Investigation ofThe Use of Magnesium Slag as a New Cement Replacement Pozzolan

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Abstract

Since 2016, for the first time in Turkey, including in Europe, domestic magnesium metal has started to be produced from the dolomite mine in an integrated manner. Magnesium ingots with a purity of 99.80% and a weight of 8-12 kg are produced in the industrial-scale facility. During the production of magnesium metal at the facility, 60,000 tons of magnesium slag per year is stored as waste without being recycled. In this study, it is aimed to reintroduce the slags produced in magnesium production to the national economy. As a result of the mineralogical tests carried out on the magnesium slag samples, the presence of some clinker minerals was found in the magnesium slag. Then, pozzolanic activity tests with magnesium slag were performed and it was seen that the results (15-18 MPa) were equivalent to the highest pozzolanic strength property seen in Turkey. As a result of the preliminary studies, it has been predicted that magnesium slag can be used as an additive material equivalent to clinker in cement production. Then, physical and chemical analysis tests, SEM and XRD tests of cement and mortars produced with magnesium slag additive were carried out. As a result, it was concluded that magnesium slag can be successfully used in cement production up to 50% admixture thanks to its superior mineralogical properties. As a result of the study, if magnesium slags are evaluated as an additive in the cement sector, it is expected that the cement production costs will decrease, the cement raw material resources can be used more economically and with a long life, and an environmentally friendly green production will be made as a result of the reduction of CO_2 emissions.

Keywords: Magnesium Slag, Cement, Pozzolan, Mortar, Hydraulic Properties

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Evaluation de la Performance des Appuis Séismique Sous les Réservoirs Surélevés

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Résumé

Les réservoirs surélevés sont des ouvrages d'arts hydrauliques très utilisés dans les systèmes de distributions des eaux potables et dans plusieurs industries pour le stockage des produits chimiques ou toxiques. La bonne conception de ces ouvrages lors d'un séisme est très importante car leur destruction peut donner lieu à des catastrophes écologiques et peut handicaper les opérations du lendemain du séisme. Pour cela, la technique d'isolement de ce type d'ouvrage, permettant de dissiper le maximum d'énergie sismique et l'absorber.La présente étude est consacrée à l'évaluation de l'effet des appuis sismiques sur le comportement dynamique des réservoirs surélevés .

Keywords: Analyse dynamique , Interaction fluide-structure, Réservoirs, Appuis dynamiques

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Investigation of Deformation Induced Martensitic Transformation and Powder Morphology of 304 Stainless Steel as a Function of Milling Time

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Abstract

In this study, 304 stainless steel was nanostructured by mechanical alloying from elemental powders. Effect of severe plastic deformation induced during high energy mechanical alloying on phase transformation and particle morphology was investigated as a function of milling time from 15 minutes up to 30 hours. The microstructural evolution of the as-milled powders was characterized by means of X-ray diffraction (XRD) and scanning electron microscopy (SEM) techniques. A mathematical model adopted from literature was utilized to estimate the martensite percentage as a function of milling time. It was found that the austenite-to-martensite phase transformation was triggered in the early stage of milling reaching to about 20% after 2.5 hours milling. The martensite percentage was determined as around 90% after 7.5 hours of milling and remained above 90% up to 30 hours of room temperature milling. Electron microscopy analysis of the milled powders suggested that average particle size increased with increasing milling time. That is, as-received particle sizes of Fe, Cr, and Ni were 15 μm, 50 μm, and 150 μm, respectively. Average particle size of milled powders change with increasing milling time. The results have revealed that austenite in as-received powder partially transformed to martensite phase during mechanical milling. Furthermore, while the austenite-to-martensite phase ratio increased with increasing milling time, the equilibrium structure was not achieved after milling up to 30 hours resulting in a dual-phased steels. Also, result show that while phase transformation was completed before 10 hours of milling grain size reduction continued up to 30 hours milling.

Keywords: Mechanical alloying, deformation induced phase transformation, martensite, austenite, stainless steels.

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Noise Reduction of Household-Type Air Purifier Device

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Abstract

The interest in air purifier devices is increasing both with the Covid19 pandemic and the increase in air pollution. The expected performance from these devices, which have an important place in daily life, is to clean dust and microorganisms such as invisible viruses, bacteria, etc., that can harm human health. Since the devices are in continuous operation, the quiet operation has become a matter to be considered while cleaning the environment to avoid harming the human ear and providing acoustic comfort. Within the scope of this study, a 3-stage household air cleaner with a cleaning capacity of 200 m3 was studied. The volumetric flow rate and velocity in the air outlet region of the current device were experimentally verified by Computational Fluid Dynamics numerical studies using the k-ε turbulence model. Turbulent regions and flow separations are determined by the numerical study. The scroll design that provides air guidance and the centrifugal fan motor location are changed to minimize turbulent areas and flow separations. It was experimentally proven that noise was decreased by about 3 dB(A) without reducing the flow rate according to FFT numerical study in acoustic laboratories. In the enhanced design, which is achieved by providing air guidance, the power consumption is reduced by 10 %.

Keywords : CFD, FFT, Noise Reduction, Air Purifier, Turbulence

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Bakliyatlarda Riboflavin Biyoerişilebilirliğinin in-vitro Gastrointestinal Model ile Belirlenmesi

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Özet

Bu çalışmada, baklagillerde farklı pişirme yöntemlerine göre ortaya çıkan riboflavin pişirme kayıplarının ve riboflavin biyoerişilebilirliğinin belirlenmesi amaçlanmıştır. Baklagillerin popülaritesi; sağlığa olumlu etkileri, düşük maliyetli protein kaynağı oluşu ve düşük karbon salınımı nedeniyle son yıllarda giderek artmaktadır. Gıdaların pişirilmesi ve hazırlanması sırasında, dikkate değer ölçüde besin kayıpları meydana gelmektedir. Tüketimi her geçen gün artan baklagillerin pişirme kayıpları ve biyoerişilebilirliği konusundaki literatür eski verilerden oluşmaktadır. Sağlıklı bir diyeti desteklemek ve tamamlamak için günümüzde verilerin güncellenmesi önemlidir. Bu nedenle bu çalışmada, baklagillerdeki riboflavin miktarları ölçülerek, farklı pişirme metodları ile riboflavinin pişirme kayıpları ve in vitro sindirim modeli ile riboflavinin biyoerişilebilirliği araştırılmıştır. Baklagillerin riboflavin içeriği; çiğ, tencerede pişirilmiş, düdüklü tencerede pişirilmiş ve her iki yöntem ile pişirilen baklagillerin in vitro ortamda sindirilmiş haliyle ölçülmüştür. Biyoerişilebilirliğin belirlenmesi için, insan gastrointestinal sisteminin biyokimyasal süreçlerini simüle eden in vitro yöntem kullanılmıştır. İstatistiksel değerlendirme, tek yönlü varyans analizi (ANOVA, $p<0.05$, Tukey's testi) ile yapılmıştır. Düdüklü tencerede ve normal tencerede pişirilen baklagillerin ortalama riboflavin pişirme kayıpları sırasıyla %13.5 ve %38.6 olarak belirlenmiştir. Düdüklü tencerede ve normal tencerede pişirilen baklagillerin ortalama riboflavin biyoerişilebilirliği sırasıyla %58.1 ve %57.6 olarak bulunmuştur. HPLC analizi sonucunda, baklagillerde düdüklü tencerede pişirme yönteminde daha az pişirme kaybı ve daha yüksek biyoerişilebilirlik olduğu tespit edilmiştir. Ancak, iki pişirme yöntemi arasında istatistiksel olarak anlamlı bir fark görülmemiştir. Baklagil pişirilmesinde, riboflavin pişirme kayıplarının daha az olması ve riboflavin biyoerişilebilirliğinin daha yüksek olması nedeniyle, düdüklü tencerede pişirme yöntemi önerilebilir.

Anahtar Kelimeler: Baklagiller, Riboflavin, Pişirme kayıpları, İn vitro sindirim, Biyoerişilebilirlik

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Kırmızı Etlerde Riboflavin Pişirme Kayıplarının ve in-vitro Gastrointestinal Sistem ile Biyoerişilebilirliğinin Araştırılması

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Özet

Bu çalışmanın amacı, farklı pişirme yöntemleri ile etlerdeki riboflavin kayıplarını belirlemek ve simüle edilmiş bir in vitro gastrointestinal sindirim modeli kullanarak pişirilmiş etlerdeki riboflavinin biyoerişilebilirliğini incelemektir. Çalışmada, İstanbul'daki kasaplardan temin edilen dana ve koyun etleri; haşlama, kavurma, kızartma ve ızgara yöntemiyle pişirilmiştir ve etlerdeki riboflavinin biyoerişilebilirliği in vitro sindirim modeli kullanılarak HPLC cihazı ile incelenmiştir. Çiğ etlerdeki riboflavin miktarı 75 – 195 µg/100 g aralığında ölçülmüştür. Etlerdeki riboflavin pişirme kaybı değerleri %5,09 ile %89,23 arasında bulunmuştur. En yüksek riboflavin kaybı kavurma yöntemi ile pişirilen dana butunda tespit edilmiştir. En düşük kayıp ise haşlama yöntemi ile pişirilen koyun butunda tespit edilmiştir. Pişirme kayıpları, haşlama yönteminde %5,09 – 66,66, kavurma yönteminde %8,91 – 89,23, kızartma yönteminde %27,21 – 41,33 aralığında ve ızgara yönteminde ise %47,11 olmuştur. Sindirim sonrası riboflavin miktarları, haşlanmış etlerde 18 – 39,85 µg/100 g, kavrulmuş etlerde 9 – 30 µg/100 g, kızarmış etlerde 16 – 56 µg/100 g aralığında ve ızgara ette 33 µg/100 g bulunmuştur. Pişmiş etlerdeki riboflavin biyoerişilebilirlikleri, haşlamada %14 – 25, kavurmada %10 – 37, kızartmada %37 – 45 ve ızgarada %60 olarak belirlenmiştir. Bu çalışmada, beslenmenin önemli bir parçası olan etlerdeki riboflavin içeriğinin in vitro sindirimden etkilendiği ortaya konulmuştur. Gıdaların pişirilmesi ile besin kayıplarının meydana gelebileceği, iyi bilinen bir gerçektir. Etlerdeki vitamin içeriğini korumak ve biyoerişilebilirliğini artırmak için doğru pişirme yöntemi seçilmelidir. Çalışmamızda, en yüksek riboflavin biyoerişilebiliriliği %60 ile ızgara yönteminde tespit edilmiştir. Bununla birlikte, etlerdeki riboflavin biyoerişilebilirliği hakkında az sayıda çalışma bulunmaktadır. Bu konuda daha fazla çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: Kırmızı etler, Riboflavin, Pişirme kayıpları, Biyoerişilebilirlik

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Surface and Tribological Characterization of Borided GS 38-15 Gray Cast Iron

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Abstract

A powder pack boriding combination including 85%B_4C as boron source and 15% Na_2CO_3 as activator was developed and employed for the boriding procedure of GS 38-15 gray cast iron. In this investigation, the boriding treatment was carried out at 950° C for 1h up to 4 hours. Optical microscopy, SEM, ESD analysis, Daimler-Benz Rockwell C indentation test and wear scratch tests were used to characterize the generated boride layers. On the cast iron samples, a single-phase boride layer with saw-tooth morphology formed for both treatment durations. The thickness of the boride layer has increased from 41µm up to 95µm as the boriding duration. Borides produced on the GS 38-15 had a hardness of 2098 $HV_{0.05}$. The tribological behaviour and adhesion resistance of boride coatings were investigated using a spinning ball-on-disk tribometer with a sliding distance of 100 m and a load of 10N, as well as the wear scratch test and the Daimler-Benz Rockwell C indentation test.

Keywords: Tribological behaviour, Boride layer, Characterization; GS 38-15 gray cast iron

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Characterization of Multifunctional Materials by Dielectric and Anelastic Spectroscopies

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Abstract

The field of multifunctional materials (like piezoelectrics, ferroelectrics, antiferoelectrics, relaxors, ferroelectric composites, multiferroics etc.) is continuously expanding due to the strong interest for applications in sensors, actuators, robotics, energy harvesting, energy storage etc. Improvements in the properties of these materials are conditioned by careful characterization with different techniques. Among them, dielectric and anelastic spectroscopies are distinguished by their capability to bring light in the study of phase transitions and of the microscopic mechanisms associated with the presence of defects. The dielectric spectroscopy measures the dielectric susceptibility $\chi(\omega,T)$ and it is sensitive to fluctuations of electric dipoles, while the anelastic spectroscopy measures the elastic compliance or elastic susceptibility $s(\omega,T)$ and it is sensitive to fluctuations of elastic dipoles. Dielectric and elastic susceptibilities are complex quantities, their imaginary parts being due to the delayed response of the mobile defects coupled to the electric field and mechanical stress, respectively. The dielectric spectroscopy is sensitive to both electric dipoles as well as free charges movement caused by the driving electric field. The anelastic spectroscopy reveals the elastic dipoles movement but is insensitive to free charges. Therefore there is a great advantage of using a combination of both techniques since it is possible to measure the dynamics of ions also in the presence of free charges. We have employed these techniques mainly for the study of structural phase transitions and the study of microscopic mechanisms associated with the presence of defects, for different functional materials: ferroelectric ceramics [1-4], multiferroics [5], ferroelectric composites [6] and organic-inorganic perovskite photovoltaics [7]. Thanks to the combination of the two spectroscopies, it has been possible to probe more accurately the structural transitions involving the antiferrodisortive tilt modes of the octahedra in lead zirconate titanate (PZT). An example of the results from both techniques is given in the figure below, where the dependence of elastic compliance and dielectric susceptibility on temperature is displayed, for a series of PZT compositions with different titanium content.

Contribution to Thin Film CIGS Absorbers Study

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Abstract

This work concerns the photovoltaic field where economic and environmental problems are crucial. The major challenge is the realization of devices allowing the improvement of the power/cost ratio, which explains the motivation to introduce new materials with a minimal cost. As the absorber material is the essential element in the realization of a solar cell, we propose to study the absorber layer according to several parameters. We have chosen the copper indium gallium selenide (CIGS) as the absorber material since it feels well the requirements of an economic nature. The study was carried out by simulation to guide researchers in adjusting the development process and minimizing manufacturing time and cost. We have implemented the free software SCAPS-1D for the optimization of the physical and geometric parameters of the solar cells. We particularly succeeded in optimizing the parameters of the absorber layer (namely the level of doping and the thickness). We also studied the temperature and metallic contact effects. Thanks to the optimal values, we managed to increase the conversion efficiency from 19.61% to 20.33%. The obtained results are satisfactory and encouraging.

Keywords : Absorber materials, CIGS, Conversion efficiency.

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Prediction of Induced Phenomena by Interaction of Electron Beams with Solid Targets

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Abstract

This work is a contribution to the study of electron-solid interactions that can be implemented in several applications including surface characterization techniques and electronic spectroscopy. Our study was carried out by simulation using the free CASINO software based on Monte Carlo methods. We considered different target materials namely: silicon (Si), zinc sulphide (ZnS) and Cu2ZnSnS4 (CZTS).
We succeeded in predicting several physical phenomena for incident electrons of energies lower than 50 keV, namely: The calculation of the trajectory of the primary and backscattered electrons in the target, the energy absorbed in the interaction volume, the energy of the transmitted electrons and the microanalysis of X-rays. Thanks to this work, we have also succeeded in predicting the surface morphology of the considered materials.

Keywords: electron-solid interaction, Monte Carlo simulation, CASINO software.

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Susuz Boraks Katkısının Alüminyum Malzemelerin Vickers Sertlik ve İz Modülü Değerlerine Etkisinin İncelenmesi ve Eniyilenmesi

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Özet

Bu çalışmada matris malzemesi olarak hafifliği, dayanımı ve fonksiyonel olması özellikleriyle ön plana çıkan alüminyum malzemesi (Al) ve katkı malzemesi olarak ise bor mineralinin bir çeşidi olan susuz boraks (SB) maddesi kullanılarak alüminyum matrisli kompozit malzeme üretimi gerçekleştirilmiştir. Bu kapsamda alüminyum malzemenin Vickers sertlik ve İz modülü değerlerini artırmak için farklı ağırlıkça oranlarda susuz boraks farklı alüminyum serileri ile karıştırılarak toz metalurjisi yöntemiyle üretilmiş ve deney tasarım yöntemiyle kompozit malzemenin sertlik ve iz modülü değerlerinin eniyilemesi çalışması gerçekleştirilmiştir. Taguchi deney tasarım yöntemi kullanılarak gerçekleştirilen çalışmada kompozit malzeme özelliklerine etkisi olduğu düşünülen alüminyum serisi (saf, 1050, 5754), susuz boraks katkı oranı (%1, %2.5, %5), sinterleme sıcaklığına ısıtma hızı (5^{o}C/dak, 10^{o}C/dak, 20^{o}C/dak) ve sinterleme sıcaklığında bekleme süresi (5dak, 10dak, 20dak) kontrol parametreleri olarak seçilmiş ve bu parametrelerin üç seviyesine bağlı olarak Taguchi L9 ortogonal deney dizini oluşturularak kompozit malzeme üretimleri gerçekleştirilmiştir. Al/SB kompozit malzemelerin BS EN ISO 14577-1 standardına göre Vickers sertliği (HV) ve İz modülü (E_{IT}) değerleri ölçümleri gerçekleştirilmiş ve sinyal/gürültü analizi sonrası Vickers sertlik değeri üzerindeki en etkili parametrenin malzeme (alüminyum serisi) olduğu belirlenirken İz modülü değeri için ise en etkili parametrenin SB katkı oranı olduğu belirlenmiştir. Vickers sertlik ve İz modülü değerlerini en iyileyen parametrelerin sırasıyla 5457 alüminyum serisi, %1 SB katkı oranı, 10^{o}C/dak ısıtma hızı ve 10dak bekleme süresi olduğu tespit edilmiştir.

Anahtar Kelimeler: Alüminyum, Susuz Boraks, Toz Metalurjisi, Sertlik.

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Real-Coded Genetic Algorithm for Optimum Data Transmission

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Abstract

Electron energy analysers have been designed to analyse charged-particle beams at specific energies. Electrons reach the detector at different times. Since electrons with different energies follow different orbits within these analysers. In particular, determining of the transit times of charged particles is important for collision experiments. In this study, optimum solutions for transit times of charged particles were provided using a real-coded genetic algorithm. The best solution hyper parameters were determined to be uniform crossover with a rate of 0.75 and mutation rate of 0.01. The proposed algorithm ensures an optimal solution for optical problems of electron energy analysers.

Keywords: Electron spectroscopy, electron beam, energy analyser, genetic algorithm.

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Çok Cidarlı Karbon Nanotüp Takviyeli Poliüretan Kompozitlerin Eğilme Dayanımı

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Özet

Geleneksel monolitik malzemelerin (örneğin metal, seramik, polimer vb.) farklı uygulamalarda kullanımı, insan uygarlığının başlangıcından bugüne kadar yaygın olarak uygulanmaktadır. Günümüzde ise kompozit malzemeler, birkaç farklı bileşen malzemenin avantajlarını birleştirerek malzeme performansının optimizasyonunda büyük bir potansiyel sunan ve en hızlı büyüyen malzeme sınıfları arasındadır. Poliüretan kompozitler (PUC'ler) düşük yoğunluk, mükemmel esneklik, şekil hafızası, yüksek aşınma direnci, korozyon direnci, kopmada yüksek uzama, sönümleme yeteneği, hava koşullarına dayanıklılık, yüksek elastikiyet, yaşlanma önleyici, iyi işlenebilirlik, yüksek darbe dayanımı, mükemmel parlaklık gibi takdire şayan özelliklere sahiptir. CNT ile güçlendirilmiş polimer nanokompozitler hem akademik hem de endüstriyel alanlarda malzeme biliminde dikkate değer bir dönüm noktası haline gelmiştir. Takviye için CNT'nin eklenmesi PU kompozitin sertliğini, çekme dayanımını, modülünü, eğilme dayanımını, ısıl iletkenliğini ve ısıl kararlılığını arttırdığı yapılan araştırmalarda gözlemlenmiştir. Yapılan bu çalışmada PU / MWCNT kompozitlerin üç noktalı eğilme testleri, ağırlıkça % 0.25 MWCNT içeren PU kompozitin eğilme dayanımı, saf PU ile karşılaştırıldığında iyileştirildiğini ortaya koymuştur. MWCNT takviyeli poliüretan nanokompozit malzemeler ASTM D790-02 standardına göre hazırlanarak eğilme dayanımı ve birim şekil değişimi değerleri incelenmiştir. Saf poliüretanın eğilme dayanımı 25 MPa iken %0.25 MWCNT takviyeli poliüretanın eğilme dayanımı 41.05 MPa olarak ölçülmüş ve %64.2'lik bir artış gözlemlenmiştir. Birim şekil değişiminde ise saf poliüretan 7.76 mm\mm iken %0.25 MWCNT takviyeli nanokompozit malzemenin birim şekil değişimi 1.31 mm\mm olarak hesaplanmış ve %83.11'lik bir azalma sergilemiştir. Ayrıca kırık yüzeylerin hasar davranışları taramalı elektron mikroskobu (SEM) ile incelenmiştir.

Anahtar Kelimeler: MWCNT, Poliüretan, Nanokompozit, Eğilme dayanımı, Hasar mekanizmaları

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The Photocatalytic Properties Study of The Spinel $FeCo_2O_4$ Synthetized by Co-Precipitation

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Abstract

In this work, spinel $FeCo_2O_4$ is prepared by the co-precipitation method. It was characterized by photoelectrochemistry. The X-ray diffraction (XRD) indicated single phase crystallizing in the spinel structure with an average particle size of 35 nm. The UV–Visible spectrum of the black product exhibits a direct optical transition at 1.53 eV. The diffuse reflectance shows a direct band gap well matched to the solar spectrum. The capacitance measurement indicated n-type conduction where the valence band, has a less anodic potential than the H_2O/H_2 couple, thus yielding O_2 evolution under visible irradiation with a good rate evolution.

Keywords: Spinel FeCo2O4, Co-precipitation, Photocatalytic

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Influence of Operational Parameters on the Retention of Basic Fuchsin Dye onto Moringa Oleifera Seeds

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Abstract

The adsorption is the most effective technique widely used to remove pollutants from wastewater. The high cost of adsorbents leads researchers to find other less expensive substitutes such as natural adsorbents, like Moringa Oleifera Seeds (MOS).
In this work, MOS were used in their natural state, without preparation or chemical modification, to study the retention of Basic Fuchsin (BF) dye from aqueous solutions in a batch adsorber at room temperature. The characterization of the material was carried out by both FTIR and SEM-EDX techniques. A series of experiments was carried out in order to study the influence of certain parameters on the yield and the retention capacity of the dye on MOS such as the contact time, the adsorbent mass, the pH, and the initial dye concentration.
Obtained experimental results show that the retention of BF on MOS is indeed influenced by the variation of pH. Equilibrium is reached during 3 hours at pH of 5 on 1.2 g of materials. The adsorbed quantity increases with the increase of the BF initial concentration. About 42% of BF was reached under these conditions. The pseudo-first order model describes well the adsorption kinetics. The adsorption isotherms of adsorbent/adsorbate systems are satisfactorily described by the Freundlich model which supposes a multilayer adsorption on heterogeneous surfaces.
The experiments carried out have shown that MOS materials are suitable for discoloration of wastewater. They have a remarkable efficiency in the field of water treatment and can be envisaged for use as alternative adsorbent.

Keywords: Moringa Oleifera, Basic Fuchsin, Dye, Natural Materials.

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Characterization of Clearcoats with Different Siloxane Additives by Surface Energy Measurements

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Abstract

The aim of this study is to compare the surface effects of various polysiloxane additives on clear coat formed with acrylic-polyester polymers cross-linked with melamine and isocyanates in terms of surface energy and adhesion. Polysiloxane additives reducing the surface energy, facilitate adhesion and improve the stone impact resistance of the automotive clear coat. On the other hand, siloxane additives tend to migrate easily to the surface due to their low surface energy.

In this study, we performed several characterization methods to observe the effects of different siloxane additives which have different chemistry. Surface characterization was done by measuring surface energy measurement. Also, adhesion and interfacial tension calculations were done theoretically. The adhesion of coating was measured and stone chip resistance test was performed according to SAE J400 standard.

Keywords: Siloxane, surface energy, adhesion, interfacial tension

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Microscopic Characterization of Self-Healing Clearcoats: Effect of Glass Transition and Annealing Temperature

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Abstract

Automotive clearcoats are aimed to protect the sub-coatings from harsh environments with long-term stability. That is the reason, many types of research are efforted to improve the scratch resistance of the clearcoats by several types of additives and/or tuning the polymer crosslinking densities. However, these approaches have some limitations in terms of elasticity, processability, transparency, and compatibility. Alternatively, organic coatings with self-healing abilities have an attraction to be used as clearcoats.
In this study, microscopic and thermal characterization of self-healing clearcoats were investigated and related to each other. The average depth of the scratches formed by the crock meter was measured before and after thermal treatment at certain temperatures. Thermal characterizations were performed by both Dynamic Mechanical Analysis (DMA) and Differential Thermal Analysis (DSC). Scratch resistance of the clear coats was related to the glass transition temperatures and elastic modulus values depending on the thermal treatment temperatures.

Keywords: Self-healing, Glass Transition Temperature, Microscopy, Scratch Resistance

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Thermal and Mechanic Characterization of Polyurethane Coatings with Various Hardener Ratios

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Abstract

Two-component polyurethane systems were one of the most used coating systems in the automotive industry in terms of adhesion strength, high resistance to environmental degradation, high-performance anti-corrosion protection, and low cost. Normally polyacrylic resin with an -OH functional group and a poly isocyanate hardener are used in these kinds of systems. Optimization of the ratio of hydroxyl and isocyanate functional groups is an important issue, but it is mostly done empirically.

In this study, we performed several characterization methods to observe the effects of various resin-to-hardener ratios as 10:1, 5:1, 4:1, 3:1, 2:1, and 1:1 by volume. Thermal characterizations were done by both Dynamic Mechanical Analysis (DMA) and Differential Scanning Calorimetry (DSC). Fourier transforms Infrared Spectroscopy (FTIR) was also applied to observe polyurethane and isocyanate peaks and obtain the calibration. Scratch resistance and hardness tests were performed by crock-meter and gloss retention measurements. Consequently, in this study, it is proposed to investigate the effect of hardener variation on the protective properties of polyurethane coating by providing a relationship with both the thermal characterization methods to scratch resistance tests.

Keywords: Polyurethane, hardener, thermal characterization, scratch resistance

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Microstructural Characteristics and Mechanical Properties of Rotary Friction Welded Dissimilar Rod-to-Plate Joints of AISI431/AISI 1018 Steel

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Abstract

The main objective of this investigation is to analyze the microstructural characteristics and strength performance of dissimilar rod to plate joints of AISI 431/AISI 1018 steel developed using rotary friction welding (RFW) by using optimized process parameters. The microstructural characteristics of different regions were analyzed using optical microscopy. The tensile properties and microhardness were evaluated to access the joint performance. The microhardness distribution across the cross-sectional region was done and correlated to the tensile failure. The scanning electron microscopy (SEM) was utilized to analyze the fractured region of dissimilar rod to plate tensile specimens. Results showed that the dissimilar rod to plate joints of AISI 431/AISI 1018 steel exhibited the tensile strength (TS) of 650 MPa, yield strength (YS) of 452 MPa and % elongation (EL) of 19%. The microhardness of weld interface was observed to be higher up to 515 $HV_{0.5}$. The dissimilar rod to plate joints failed in HAZ due to grain coarsening and lower hardness. The dissimilar rod to plate joints showed 47.72%, 32.55% and 26.67% improvement in TS, YS and % EL compared to base metal plate. The enhancement in tensile properties and hardness of joints is due to the evolution of finer grain microstructure in weld interface zone.

Keywords: Rotary friction welding, AISI 431 steel, AISI 1018 steel, dissimilar rod to plate joint, microstructure, tensile properties, hardness.

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Tensile and Impact Toughness Properties of Rotary Friction Welded Inconel 718 Alloy Joints

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Abstract

An investigation of rotary friction joints similar to Inconel 718 joints was described here with detailed mechanical and microstructural properties. Forging pressure, friction pressure, friction time, and forging time were all determined to be optimal parameters. Maximum 1238 MPa tensile strength was obtained through the optimum parameter maximum hardness was determined to be 487 HV. Macrostructure was used to study rotary friction welding flows under lower magnification. To determine the characteristics of similar joints, a microstructure analysis was conducted at the weld and adjacent regions. Finally, results showed the thermo mechanically affected zone (TMAZ) was responsible for the majority of failures. This research also aims to demonstrate similar joint characteristics associated with Inconel 718 for aerospace and defense. All joints underwent detailed microstructural and SEM-EDS analyses at the interface.

Keywords: RFW, Inconel 718 similar, Tensile Properties, Microstructure, EDS, SEM.

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Investigation of the Usability of Limestone Aggregate Sources in the Production of Concrete in Çankiri

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Abstract

In this study, the usability of limestone extracted from three different aggregate quarries located in Çankırı province as concrete aggregate was investigated. For this purpose, aggregate samples were taken from the three quarries and on the samples taken, sieve analysis, specific gravity, water absorption, bulk density, fine material content, flakiness index, methylene blue, disintegration strength, abrasion resistance, freeze-thaw, alkali-silica reactivity, acid soluble sulfate and total sulfur tests were carried out. Finally, the results of the tests performed on aggregates obtained from the limestone quarries around Çapar village (Şabanözü, Çankırı), Seydiköy (Eldivan,Çankırı) and Korgun (Çankırı) were compared with the limit values given in the standards and the usability of limestone as concrete aggregates was determined.

Keywords: Limestone, Quarries, Aggregate, Aggregate usability tests

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New Limphotropic Anti-Inflammatory Drug Based on Licorice

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Abstract

The Republic of Azerbaijan has pursued a strong policy in building an independent, democratic, legal, civil and secular state. The rich medicinal flora, fauna and mineral natural resources of the Republic of Azerbaijan invent unlimited conditions for the creation of promising pharmaceutical products. The solution to the problem of the development and subsequent use in medical practice of medicines based on natural ingredients obtained from local resources in order to protect the health of the nation is of great social importance.
Azerbaijan has long been known as a country with significant reserves of naked licorice (Glycyrriza glabra L.), which made it possible to organize the Licorice Industrial Park in the republic, which creates a real industrial platform for the production of dosage forms containing licorice.
On May 15, 2012, the President of the Republic of Azerbaijan Ilham Aliyev signed Guideline No. 2/483 "On the rational use of the natural resources of Azerbaijan, including the richest plant flora and fauna in order to create pharmaceutical products and industries to satisfy the population with affordable high-quality, effective, safe medicinal means ".
As a guide to action in October 2012, the national LLC "Products Licorice" - "Biyan Products" was created, which is engaged in the development of pharmaceutical products based on licorice, the production of technical, food, and pharmaceutical products of licorice and their sale. To this end, Biyan Products LLC purchased a land area of 1039 hectares in the Agdash region and created a plantation of naked licorice - Glycyrrhiza glabra L. on 1000 hectares, and also built on an area of 23 hectares the largest National Industrial Park "Licorice", including the Plant for the procurement, processing of licorice and the production of medicinal products on 11-12 hectares of land for the receipt of raw materials.
Currently, this Industrial Park "Licorice" is the most promising in Azerbaijan in terms of capacity for the production of phytopreparations.
Thus, the development of technologies for various pharmaceutical products and their dosage forms containing effective components of licorice naked for use in various fields of medicine and cosmetology, with subsequent marketing research of these products and implementation in national industrial production, is a timely, relevant, and promising research direction.

Keywords*:* licorice, pharmaceutical products, industrial platform.

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Synthesis and Structural Characterization of New Indolizinic Derivatives with Potential Anticancer Properties

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Abstract

The indolizine synthetic derivatives deserve special attention because of their pharmacological properties, but also for their interesting fluorescence. Thus, indolizine core has found numerous applications in the synthesis of biologically active compounds. Our group recently reported several indolizines with excellent anticancer activity and good tubulin polymerization inhibitory potency. Inspired by these results, the goal of this study was the synthesis of several new indolizine derivatives substituted at positions 6, 7 and 8, respectively, to gey deeper insights regarding their anticancer activity. Therefore, our study started with 3-bromopyridine and ethyl isonicotinate in order to obtain new indolizines to be tested for their anticancer activity.
The structures of the new compounds (monoquaternary salts and fused pyridines) were proved using spectral methods. All new derivatives are under evaluation for their anticancer properties.

Keywords : indolizine, 3+2 cycloaddition, anticancer.

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Almost Unbiased Liu Estimation for Gamma Model: Application to Chemical Data

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Abstract

Gamma regression models are popularly used for continuous data that show positively skewed in chemometrics application area. The correlation among variables of the skewed data leads to the presence of a multicollinearity problem. To combat this problem, the gamma regression analysis using almost unbiased Liu estimator is a very attractive method. A performance criterion, predictive mean squared error, is taken into consideration to compare the almost unbiased Liu, Liu and iteratively re-weighted least squares estimators. The comparison of estimators is evaluated using a real chemometrics application. The results of real application confirmed the superiority of the almost unbiased Liu estimator to other estimators.

Keywords: Gamma Regression, Almost Unbiased Liu Estimator, Predictive Mean Squared Error.

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A Review on the Construction Sector in Mali

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Abstract

The developments in the construction sector with all over the world, the housing sector in Mali has become one of the developing areas. Mali is a country that has sufficient underground resources, especially in terms of construction raw material potential (limestone, marble, granite, cement, etc.). Other materials needed by the housing sector (glass, electrical products, plumbing, etc.). some of them are met by importing from European countries. Mali's housing need is approximately 120,000 houses per year. The increase in the number of houses built in recent years continues. Many housing projects are underway by both state and private enterprises. Many housing projects are ongoing and supported by both state and private enterprises. In addition, the importance given to the construction sector comes to the forefront by building 3,000 houses under the concept of "new city", which includes many needs (school, shops, health, sports and administrative facilities, etc.).

Keywords: Construction, Raw material, New city

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Development of the Agricultural Sector in Mali

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Abstract

In Mali, 51% of the country's total area of 1.24 million square kilometers consists of desert land. Agricultural cultivated areas represent 4.8 million hectares or 4% of the area. Due to the geographical location of the country, agricultural production varies depending on the precipitation level. Mali's economy is heavily dependent on the agro-pastoral sector, which contributes 33% of GDP. Crop production in Mali includes cereals such as corn, rice and peanuts, cotton, etc. contains. While approximately 80% of the grain production meets the needs of the domestic market, around 20% goes to export. In addition, Mali is the 2nd largest mango exporter in Europe. In this study, the contribution of the agricultural sector to Mali was investigated.

Keywords: Mali, Agricultural, Export.

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Investigation of Investments in the Field of Transportation in Mali

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Abstract

Mali has carried out numerous economic reforms over the past few years to stimulate the development of the private sector. The transport sector, which is one of these areas, is also strongly encouraged. There are road, water and electricity infrastructure development projects and new housing projects, which are national priorities for the country's economic development by bringing the country to the forefront in the international arena. Importance is given to the construction of asphalt roads for faster transportation of products at the point of export and import. In this context, investments on trade and transportation between railway networks and neighboring countries continue. Mali has 25 airports, 6 of which are international in major economic and tourist cities. It is expected that the development of the transportation sector will both meet the needs of the increasing population and stimulate the country's economy by attracting more investments from abroad.

Keywords: Water and Electricity infrastructure, Railway, Airport.

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Tek Bir Banyodan Elektro Depolama Yöntemi ile Elde Edilen Ni-W ve Ni-W/hBN Kaplamalarının Karşılaştırılması

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Abstract

It is known that nickel (Ni) has resistance to corrosion, hardness, ability to change size in magnetic field and adhesion strength. It has been seen in the examinations that tungsten (W) is used in hard, high melting temperature and crack removal method. In addition, a new Ni-W/hBN alloy composite coating material was formed by electrodeposition method, using Hexegonal Boron Nitride (hBN) to increase its lubricity, hardness and corrosion resistance. In this study, four different samples of Ni-W and Ni-W/hBN coatings obtained by using the electro-deposition method were obtained from a single bath and the microhardness, surface roughness, corrosion resistance, optical microscope and XRD images between these samples were compared. As a result of these comparisons, in the adhesion test, it was seen that the first two samples of four different Ni-W samples obtained in the same bath had better adhesion than the third and fourth samples, and the adhesion ability of the first three samples was better than the fourth sample in the Ni-W/hBN bath. It has also been observed that hBN particles added to the Ni-W bath play a major role in increasing the hardness.

Keywords: Electrodeposition, Ni-W/hBN, Corrosion, Characterization

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Electrochemical Growth of ZnO Nanostructures on FTO Substrate for Humidity Sensor Applications

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Abstract

Electrochemical deposition of Zinc oxide (ZnO) nanostructures is employed as a humidity sensor. The XRD pattern showed the presence of ZnO hexagonal Wurtzite structures. The Raman spectroscopy studies confirmed the first order Raman scattering peaks at 99 and 444 cm-1 as high optical phonon modes of ZnO. The AFM surface topography of ZnO revealed the average surface roughness as 153.5 nm. The obtained results show that the humidity sensitivity of 0.029, limit of detection of 5.67 %RH and 0.9975 R^2 linearity. This sensor generates the distinct advantages such as highest mechanical strength, low-cost production and suitable materials for monitoring relative humidity sensing performances at compact areas.

Keywords: Humidity, Electrochemical, Surface Roughness, Raman Scattering.

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Effect of Silane Treatment on the Mechanical Properties of Cellulose Nanocrystal (CNC) Based Polymer Composites

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Abstract

In recent years, it has been demonstrated that cellulose has a high potential applicability in industrial manufacturing processes. Due to its characteristic properties such as lightness and high surface area/volume ratio, cellulose can be characterized as an appropriate reinforcement material for the development of nanocomposites. In the context of this study, %1 wt. CNC was introduced into epoxy via conventional casting method to produce composite samples. Furthermore, CNC was modified with (3-Glycidoxypropyl) trimethoxysilane (GPTES) and the composites consisted of that powder were prepared for %1 wt. concentration as well. Structural characterizations of pristine and silanized CNC were performed using attenuated total reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR). The peaks observed around 2871 and 2898 cm^{-1} corresponds to C-H stretching in the spectra of both CNC and treated CNC. But there is also a peak at 2933 which belong to C-H stretching in treated CNC as well. The absorbance peaks in the range 3330-3334 cm^{-1} are attributed to the stretching of OH groups in cellulose. The decrease in peak intensity indicates that most of the OH groups are silanized. Generally, the spectrum clearly indicates that CNC is successfully treated with GPTES. Both tensile and flexural responses of those structures were determined to reveal the effect of silanization on the mechanical properties. Based on the test results, it has been revealed that GPTES presence led to the increase of tensile and flexural strength values as 16% and 50%, respectively as compared with unmodified CNC/epoxy composites. However, elastic modulus and flexural modulus parameters of modified composites were slightly lower (approximately 10.5-11%) than the pristine CNC based structures. Although silane treatment promoted improved strength values, pure epoxy still exhibited better flexural and tensile properties. This situation can be attributed to the particle size of modified CNC. It is highly probable that grinded CNC was no longer a nano-size powder, therefore its positive effects could not be observed in mechanical tests.

Keywords : Cellulose nanocrystal (CNC), CNC/epoxy composite, mechanical properties

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Classification of Cherry Cultivars with a Hyper-Parameter Optimized Conventional Neural Network Algorithm

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Abstract

Turkey is a country that has an important place in cherry exports. Many different cultivars of cherries are grown throughout the country. Each type of cherry has many characteristic features such as taste, smell, resistance to export, etc. These features play a major role in determining the unit price of cherries. However, despite the genetic diversity of the cherry variety, the differences in appearance are so subtle that they are difficult to detect with the human eye. Classification of cherry cultivars from cherry fruits with a high success rate with artificial intelligence algorithms will eliminate an important problem of cherry producers, exporters, and customers. In addition, it will contribute to the development of the country's export policies by making it possible to quickly catalog which cherry species is developed in which density and in which regions. In this study, a Hyper Parameter Optimized Conventional Neural Network Algorithm (HPO-CNN) was used for the classification of cherry cultivars. A new dataset was compiled by taking pictures of the most produced cherries cultivars in their natural environment. The dataset, consisting of 1506 images in total, contains samples of Stella, Regina, Rainier, White Cherry and Ziraat900 cherries. The dataset, consisting of 1506 images in total, contains samples of Stella, Regina, Rainier, White Cherry and Ziraat900 cherries. The results of the training and testing processes show that the HPO-CNN algorithm can classify different cultivars of cherries with a high success rate. The findings and data set obtained as a result of the study were shared.

Keywords: Multiclass Classification, Deep Learning, Conventional Neural Networks, Hyper Parameter Optimization, Cherry Dataset

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The Effect of An Aluminum Alloy on Its Fluidity When Alloyed with a Lithium-Fluorine-Containing Compound

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Abstract

The article considers the effect of lithium fluorine compound on the fluidity property of aluminum alloy liquid. The experiments were carried out by adding lithium fluorine as alloying elements in the mass fraction. In this case, the lithium fluoride compound is included in the charge during the melting of aluminum in an amount from 5% to 15%. In the experiments, samples were taken using a resistance furnace. Based on the conducted experiments, a graph of the relationship was drawn up, on which the authors' conclusions were drawn.

Keywords: fluidity, lithium, fluorine, AK7, D16, furnace, temperature

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Great Almai Ring Road Project (Bakad)

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Abstract

BAKAD (Great Almaty Ring Road) is a road that will wrap Almatı from west to east and stretch along the northern border of the city at a distance of 20-25 kilometers from the center of the metropolis. The total length of the road is planned as 66 kilometers. In most of the region where BAKAD is built, bridges are being built while excavations are continuing. But during the construction of the Road, they will have to cut down about 15 thousand trees in total. On the other hand, afforestation works continue by planting more than 70 thousand new saplings and trees. Of the planned 66-kilometer project, 57 kilometers are 6 lanes, the remaining 9 kilometers (from Almatı - Tashkent road to Upper Kaskelen and from Kulzhinki to Talgar road) are planned to be built with 4 lanes. When the road work is completed, BAKAD will be paid. Estimated fare is expected to be 200 tenge ($0.40) for cars and 390 tenge ($0.80) for trucks. The total cost of the project is approximately 180 billion tenge. While the share of the state is 80%, the share of investors is around 20%. As a result of this road construction, both transportation and traffic will be relieved and it will contribute to the country's economy from the fees to be collected. In this study, the road construction process and the development stages of its construction will be presented.

Keywords: BAKAD, Transportation, Ring road, construction

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Influence of the Major Elements on the Acidic Leaching Recovery Performance of Rees From Turkish, Greek, and Romanian Bauxite Residues

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Abstract

Bauxite residue (BR) is an industrial waste from the alumina production via Bayer process. All around the world, 150 million tons of BR is generated per year involving ecological problem not only due to the requirement of large stock-pilling area but also the high alkalinity of the waste. Several studies have been focused in order to recovery BR which have micrometric particle size and contains critical metals. Some of these elements are highly present (Fe, Al, Si, Ti..) while others are poorly present within BR (Rare Earth Elements (REEs)…). The chemical content of BR is depending on the ores and the Bayer process parameters. Acid leaching is a way to recover these elements especially REEs which are essential for the development of new technologies. In this study, the REEs recovery efficiency via acid leaching of three different BR from Greece, Romania and Turkey aluminum plants was investigated. Firstly, these residues were characterized, thereafter the influence of their chemical contents on the recovery performance of REEs were investigated.

Keywords: Bauxite Residue, Direct acid Leaching, Efficiency, High-Pressure Acid Leaching, Selectivity

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TGD Inspired Model for Freezing in Nano Scales

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Abstract

Freezing is a phase transition, which challenges the existing view of condensed matter in nanoscales. In the TGD framework, quantum coherence is possible in all scales and gravitational quantum coherence should characterize hydrodynamics in astrophysical and even shorter scales. The hydrodynamics at the surface of the planet such as Earth, the mass of the planet and even that of the Sun should characterize gravitational Planck constant h_{gr} assignable to gravitational flux tubes mediating gravitational interactions. In this framework, quantum criticality involving $h_{eff}=nh_0>h$ phases of ordinary matter located at the magnetic body (MB) and possibly controlling ordinary matter, could be behind the criticality of also ordinary phase transitions. In this article, a model inspired by the finding that the water-air boundary involves an ice-like layer. The proposal is that also at criticality for the freezing a similar layer exists and makes possible fluctuations of the size and shape of the ice blob. At criticality, the change of the Gibbs free energy for water would be opposite that for ice and the Gibbs free energy liberated in the formation of ice layer would transform to the energy of surface tension at water-icelayer. This leads to a geometric model for the freezing phase transition involving only the surface energy proportional to the area of the water-ice boundary and the constraint term fixing the volume of water. The partial differential equations for the boundary surface are derived and discussed. If $\Delta P=0$ at the critical for the two phases at the boundary layer, the boundary consists of portions, which are minimal surfaces analogous to soap films and conformal invariance characterizing 2-D critical systems is obtained. For $\Delta P\neq 0$, conformal invariance is lost and analogs of soap bubbles are obtained.

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Axial Dynamics of Elastic Deformable Supported Nonlocal Rods Using a Higher-Order Nonlocal FEM

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Abstract

A higher-order (three-node) finite element formulation of nonlocal free vibration is studied for axial nanorods under elastic deformable boundary condition. According to this, stiffness and mass matrices are obtained by applying weighted residual-based finite element formulation (NL-FEM) to the equation of motion of rod element. By adding elastic boundary condition to NL-FEM, nonlocal nondimensional frequency parameters of clamped-axial spring attached nanorods are presented. Detailed discussions of numerical results are performed.

Keywords : Axial rod, Elastic support, Finite element, Free vibration, Nonlocal elasticity.

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Nonlocal Natural Frequencies of Shear Deformable Functionally Graded Nanobeams via Nonlocal FEM

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Abstract

In this research, the atomic size-dependent free vibration analysis of a fixed supported nanobeams made of functionally graded material (FGM) is carried out. The free vibration of nanobeam is formulated according to the nonlocal Timoshenko beam theory. The classical mixing rule is used as functionally grading. A finite element formulation based on the atomic size effect (NL-FEM) is developed to solve the equation of motion. Nondimensional natural frequencies of shear deformable FGM nanobeams are calculated for different parameters by using NL-FEM and numerical results are discussed.

Keywords: Clamped nanobeam, Finite element, Functionally graded material, Free vibration, Natural frequency, Nonlocal elasticity.

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Microstructural Investigations in Increasıng the Durability of Cold Forging Dies by the Method of Double Heat Treatment

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Abstract

The purpose of microstructural studies was to find the optimal heat treatment regimes that provide the maximum possible fine austenite grain after heat treatment of the tool. For research, samples were prepared from steel U8 with a diameter of 20 mm and a height of 5 mm. This ensured the commensurability of the cross section of the samples with the cross section of the heat-treated tool. Thermal treatment of samples, as already mentioned, consisted of the following: heating in a salt bath to temperatures of 820, 900, 1000, 1100, 1150, 1200, 1260 ºC; the heating time was 5 minutes. To ensure the formation of a martensitic structure after the first hardening, cooling was carried out in water with transfer to oil. Hardened samples had intermediate tempering at temperatures of 200, 300, 350, 450 ºC. Some of the samples were not subjected to intermediate tempering. Thus, from the point of view of achieving the minimum grain size of austenite, pre-hardening at 1100 ºC, intermediate tempering at 200, 350 and 450 ºC is preferable.

Keywords: Austenite, Heat Treatment, Reheating, Microstructure, Martensite

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Investigation of Kinetic Properties of Some Borided Alloys Obtained by Powder Metallurgy Method

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Abstract

In the study, powders were mixed homogeneously to form 93% Co-7% Mg and 97% Co-3% Mg compositions by powder metallurgy method. After the powder mixtures obtained by this method were shaped in a uniaxial press, they were subjected to sintering at 530 °C. After this process, the samples were borided for 1.5 and 4.5 hours at temperatures of 800 and 900 °C in an atmospheric furnace using commercial Ekabor II boron powder. After boriding, the samples were tested for microhardness as well as XRD and SEM analysis. The diffusion kinetics and surface properties of borided cobalt-magnesium alloys at different temperatures and durations investigated.

Keywords: cobalt-magnesium alloy, borided, kinetics, diffusion

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Elektrokimyasal Empedans Spektroskopisi Yöntemi ile Çeşitli Malzemelerin Karakterizasyonu

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Özet

Elektrokimyasal empedans spektroskopisi (EIS) korozyon, biyomedikal cihazlar, yarı iletkenler, sensörler, piller, yakıt hücreleri, elektrokimyasal kapasitörler, dielektrik ölçümler, kaplamalar, elektrokromik malzemeler, analitik kimya, elektrokataliz gibi alanlarda kullanılan geniş uygulamaları olan bir analitik tekniktir. Kolay ve hızlı bir teknik olup, ölçüm sisteminde kalıcı kusurlu etkiler bırakmayan güçlü bir yöntemdir. Bu çalışmada, çalışma elektrodu olarak farklı alanlarda kullanılan karbon nanotüp kompozit malzemeler, çelik, titanyum alaşımları, farklı aktif karbon malzemeler kullanarak elektrokimyasal hücreler oluşturulmuş ve EIS ile bu malzemelerin karakterizasyonu yapılmıştır. Platin karşıt elektrot ve Ag/AgCl referans elektrot kullanılan hücrede empedans, 10 mV salınmım potansiyeli ve 100 kHz-10 mHz frekans aralığı kullanılarak ölçülmüştür. Oluşan empedans cevapları eşdeğer elektrik devresi ile modellenmiş ve ohmik direnç, yük aktarım direnci ve kapasitans değerleri regresyon ile elde edilmiştir. EIS, elektrot yüzeylerini de incelemek için güçlü bir elektrokimyasal karakterizasyon tekniğidir. Bu çalışma elektrotlarının EIS sayesinde yüzey pürüzlülüğü ve yüzeyde akım dağılımı hakkında da bilgi elde edilmiştir.

Anahtar Kelimeler: Elektrokimyasal Empedans Spektroskopisi, Çalışma Elektrodu, Elektroaktif Malzemeler, Eşdeğer Elektrik Devresi.

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Valorisation of Diatomite and Waste Borogypsum as a Building Material

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Abstract

Most of the materials which are considered as a waste materials consist of recycled materials. It is highly important that wastes to join recycled process for protection the environment and nature balance.
This study realized to find solution environment problems because of several kind of wastes during show up factories production process.
In this study, samples are prepared based on plastic forming bases for mixture diatomite and waste boron materials. Samples are fired with specified parameters as mixture ratio, forming, fire and drying temperature. Fired samples are tested for strength, water absorption, fire shrinking, porosity, etc. As a result study target is to evaluate the specified diatomite-boron mixture based on mass ratio with test results.

Keywords : Waste, Recycling, Diatomite, Waste Boron

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Improvement of Mechanical Properties of Graphene Nanolayer Coated Glasses

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Abstract

Surfaces have attracted the attention of many scientists and many studies have been done on their properties over the centuries. It is generally accepted today that many technical material problems are surface problems. It seems that this is the reason for the great effort put into the study of surface properties and the development of various surface treatment technologies. A surface is characterized by a variety of specific physical, mechanical, and chemical properties. The surface structure may be of the crystalline, amorphous, or mixed type and may differ greatly from the mass. In most cases, the choice of substrate is predetermined, and a coating is applied to change some of its properties, eg. Anti-reflective coating of lenses, protecting a metal from corrosion or improving surface hardness. Silanization is the coating of a surface with organofunctional alkoxysilane molecules. Mineral components such as glass and metal oxide surfaces can all be silanized because they contain hydroxyl groups that attack and displace alkoxy groups on the silane, thereby forming a covalent -si-o-si- bond. Graphene is the key structural element of some carbon allotropes, including graphite, cnts, and fullerenes. Currently, graphene has become a "rising star" material after it was successfully fabricated in 2004 by andre geim and colleagues using a simple tape approach using off-the-shelf graphite. Graphene's exceptional properties, such as high surface area, tunable band gap, and excellent electrical, mechanical, thermal and conductive properties, have potential as an alternative material for the preparation of various composite materials.
In this study, it was aimed to coat the glasses with solutions containing two different silane (3-aptes and glymo) based graphene nanolayers (gnp) to increase the impact resistance. To show the effect of the gnp additive, two different rates of doping were made. Uncoated and coated glasses were characterized by % light transmittance, turbidity, cross-cut test, pencil hardness test, sem for surface morphology, xrd, ftir, knoop hardness test, ring on ring test, taber abrasion test, impact test. As a result of the tests, while the gnp additive negatively affected the % light transmittance and haze, it showed improvement in other properties.

Keywords: Waste, Recycling, Fly ash, Waste Borogypsum

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Evaluation of Fireclay Brick Waste and Waste Borogypsum as a Building Material

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Abstract

The rapid increase in production and consumption, which is a necessity of our age, has brought many problems with it and has brought up studies for the evaluation of wastes, which are considered as a secondary raw material source that can be an alternative to existing raw material sources. Within the scope of this study, the use of boron waste and fireclay brick waste from industrial wastes in brick production, the results of the high use of boron waste, which is a fusing element, in brick production, were evaluated by laboratory scale tests and the effect of different proportions of brick waste on the firing color of boron waste was investigated.

Keywords: Waste, Recycling, Fireclay, Waste Borogypsum

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Evaluation of Waste Glass and Waste Borogypsum as Building Materials

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Abstract

Within the scope of this study, the use of boron waste and waste glass in brick production, the results of the high use of boron waste, which is a fusing element, in brick production, were evaluated by laboratory scale tests, and the effect of different proportions of waste glass on the firing color of boron waste was investigated.

Keywords: Waste, Recycling, waste glass, Waste Borogypsum

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Evaluation of Granite Cutting Waste and Waste Borogypsum As Building Materials

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Abstract

It is a natural stone that contains main mineral phases such as granite, quartz, feldspar, as well as side phases such as illite, muscovite, mica, ilmenite, apatite, biotite. In addition, it has high strength and low water absorption. Thanks to this feature, it is used for floor and wall covering in buildings. The waste obtained at the end of the granite cutting system is filtered and used for vitrification purposes in the ceramic industry, in the glass ceramic industry, as an alternative to feldspar in porcelain stoneware composition, in making dark glazes, and in ceramic composition in flooring.
Borogypsum was obtained from Etibank Boric Acid production facility. Boron compounds are used in many fields. Ceramic, glass, agriculture, textile, metallurgy, cleaning and bleaching industry, nuclear industry are some of them.
The main purpose of this study; The aim is to characterize the granite cutting sludge that comes out as a process waste during granite cutting, to determine its sintering behavior and to examine its use for ceramic purposes. For this purpose, sintering experiments were carried out at different temperatures by adding borogypsum to granite waste at different rates. At the end of the experiment, defect-free materials with a density approaching the theoretical density of granite were produced. 1. Study 5. It was determined that the samples of the recipe fired at 1150 °C were sintered well, their water absorption ratio was below 4% and their bending strength was above 16 MPa.

Keywords: Waste, Recycling, granite waste, Waste Borogypsum

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Obtaining Building Materials by Hydrothermal Reaction of Marble Waste and Quartz

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Abstract

In this study, it is aimed to convert marble waste and quartz into building materials by hydrothermal reactions. Calcite, marble, and quartz were used as raw materials and white portland cement was used as additives. In the first stage, the mixture was prepared by taking the calcite and quartz under a micron in certain proportions. In the second stage, the prepared mixture was moistened by 5% and shaped with a hydraulic press. In the third stage, the shaped samples were heated to 119 ˚C and 2 atm. It was steam cured in an autoclave at pressure. In the fourth stage, water absorption, porosity, compressive strength, optical microscopy, and x-ray diffraction analyzes of the steam-cured samples were performed.
As a result, samples with marble waste gave the best water absorption, porosity, and strength. In addition, according to the results of x-ray diffraction analysis, the formation of calcium silica hydrate (CSH) was not observed. However, very good strength, water absorption, and porosity were observed in all samples.

Keywords: Waste, Recycling, marble waste, Hydrothermal reaction

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Obtaining Mullite Film by Dip Coating Method

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Abstract

In this study, coating was made on the quartz glass by dipping method. Coating solution was prepared using Al nitrate, TEOS and ethyl alcohol. The prepared solution should be such that it can form a layer on the quartz substrate surface to be coated. The substrates to be coated were first cleaned with acetone, then dipped with the prepared gel. The dipped substrate was left to dry and dipped again. This process was repeated 20 times. The purpose of dipping the substrates again after drying; to obtain the film thickness. The coated substrates were first subjected to heat treatment at 500 °C and left to cool. Then heat treatment was applied at 1200-1300 °C. XRD and Vickers hardness tests were carried out on substrates that were heat treated at 1200-1300 °C.

Keywords : Mullite, quartz, sol-gel.

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Production of Antibacterial Powders

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Abstract

In this study, research has been carried out on the production of metal ion-added antibacterial hydroxyapatite powders that can contribute to human health and environmental development and also attract the product market in different directions. In the studies, antibacterial tests of the powders produced by the wet chemical method were carried out. As a result of antibacterial tests, it has been seen that the powders have antibacterial properties.

Keywords: Antibacterial, hydroxyapatite, powder.

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Activated Carbon Production from Biomass DDGS Raw Material

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Abstract

In addition to being an alternative renewable energy source, biomass is also used as a raw material source in the production of activated carbon. Activated carbon is an artificial adsorbent with improved surface area and porosity, high carbon content, and good adsorbing properties. In this study, DDGS (Dried Distillers Grains with Solubles) was used as a biomass source, and activated carbon was produced by chemical method. That material were investigated by employing Raman and BET surface area analysis.

Keywords: Activated carbon, CO_2 adsorption, chemical reaction.

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Assessment of Residential Standalone Photovoltaic Systems in the Mega Cities of the World

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Abstract

Energy is a part of our economic and social life that makes our life easier. We obtain most of this energy we need by using fossil resources. The carbon dioxide gases we release into the atmosphere because of the use of fossil resources cause the Earth to warm up. The world is struggling with air pollution and global warming caused by carbon dioxide emissions. With each passing day, countries continue to support the transition to renewable energy sources on the road to net zero to control this problem. On the other hand, rising living standards with developing technology cause an increase in energy need. The energy needed by humanity is increasing year by year, and the increasing population, the imbalance between energy supply/demand, and the problems in energy transportation have led humanity to seek alternative energy sources.

Renewable energy resources are needed to meet this demand and build a sustainable future. The search for alternative sources to meet the energy needs has accelerated with the development of technology. The development of technology and the increase in the availability and efficiency of energy have made renewable energy resources competitive with fossil resources. Many countries have turned to renewable sources for electrification. Investments in renewable energy sources are increasing day by day, and PV systems are the most preferred by countries and the most potential among renewable energy sources. In this process, insufficient innovation, the need for advanced infrastructure, and affordability are the main obstacles to the transition to renewable energy sources. It is possible to prevent these obstacles with incentives and policy regulations. The economic and technical feasibility of PV systems with off-grid energy storage in megacities were examined by referring to the policies followed by the leading countries in PV energy and countries with high solar potential. It is simulated using the System Advisor Model (SAM) to evaluate the technical and economic feasibility of off-grid PV systems for the most populated megacities.

The simulated PV system results cover technical results such as electricity generation, losses, and efficiency. It has been observed that the selected cities have different capacity factors and production amounts due to changing sunshine hours as expected. In addition, economic values such as LCOE and LCOS are detailed in terms of applicability, and the suitability of these cities for grid parity and the possibility of investing in PV systems are emphasized. The battery-powered system, which we prefer in terms of being sustainable, will store the extra energy produced during the summer months and will be used when needed. The fact that

electricity storage is the most important element of moving to the next stage in the use of renewable energy is one of the reasons for us to research this system. Especially the development of battery storage technologies and their availability at affordable costs will play an important role in this process. The main purpose of this study, in which we evaluate the applicability of off-grid PV systems in mega cities of the world, is to increase awareness of solar energy.

Keywords: energy storage, PV systems, renewable energy, solar energy

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Yeni Tasarım Bilgisayar Destekli Z-Tarama Otomatik Kontrol Sistemiyle Doğrusal Olmayan Malzemelerin Optik Karakterizasyon Parametrelerinin Belirlenmesi

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Özet

Son yıllarda optik yöntemler kullanılarak malzemelerin farklı özelliklerinin tespit edilmesi konusunda çok hızlı gelişmeler gerçekleşti. Optik alanında yapılan birçok yeni çalışma büyük miktarda veriyi yüksek hızda işleme olanağı sunmaktadır. Deneylerden çıkan sonuçlar göstermiştir ki akım şiddeti 10^8 W/cm^2 ve daha büyük olan ışın demetleri, ortamın optik karakterini değiştirir. Bu durumda doğrusal optikle ifade edilen yapılar sistemlerin tanımlanmasında yetersiz kalmaktadır. Doğrusal olmayan parametrelerin elde edilmesi malzeme karakterizasyonu açısından oldukça önemlidir. Günümüzde doğrusal olmayan optik güncel ve aktif bir alandır bu konudaki çalışmalara her geçen gün bir yenisi eklenmektedir. Doğrusal olmayan optik günümüzde; yarıiletken teknolojisinden, izotrop ayrıştırmaya kadar çok geniş bir uygulama alanı bulabilmektedir. Bu çalışmada, doğrusal olmayan optikte farklı özelliklerdeki malzemelerin optik özelliklerinin belirlenmesi için kullanılan yöntemlerden biri olan Z-tarama tekniği, bilgisayar destekli özgün bir opto-elektromekanik düzeneğe dönüştürülmüştür. Malzeme tutucu mekanik düzenek ile lazer ışınının z ekseni boyunca hareket eden doğrusal otomatik kontrol düzeneği üzerine yerleştirilmiştir. Malzemeye aktarılan lazer ışını miktarı malzeme hareket ettiğinde, doğrusal olmayan parametrelerin elde edilmesi için yeterli bilgi sağlar. Deney sonucunda elde edilen analiz sonuçları uluslararası düzeyde elde edilen analiz sonuçları ile uygunluk göstermektedir. Sistem CS_2 ile başarıyla kalibre edilmiştir.

Anahtar Kelimeler: Doğrusal Olmayan Optik, Optik Karakterizasyon, Z-Tarama Tekniği, Opto-mekanik Sistemler, Mühendislik Uygulamaları.

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Direct Selective Laser Sintering of Silicon Carbide: Focused View on Characterization Techniques

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Abstract

D-SLS is a promising additive manufacturing (AM) technique for Silicon Carbide (SiC) powder. For SiC D-SLS to be effective, the proper process parameters have to be used. Included in these process parameters are laser power, scanning speed, layer thickness, hatch distance, and scanning strategies. This study focused on analyzing the effect of process parameters on D- SLS of SiC and ensuring that these parameters were selected appropriately. A numerical model of the SLS process has been developed in order to precisely select the process parameters. SiC samples with relative densities over 80% were successfully printed using D-SLS using additive- free SiC powder. Moreover, complicated SiC geometries were successfully printed. This study's findings will pave the way for a single process for AM of ceramic materials. Future research should concentrate on analyzing the mechanical performance of SiC samples processed with D-SLS technique.

Keywords: Additive Manufacturing, SLS, Numerical simulation, optimization.

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CS_2'nin Geçirgenlik Spektrumunun Bilgisayar Destekli Z-Tarama Otomatik Kontrol Sistemiyle Belirlenmesi

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Özet

Z Tarama tekniği malzemelerin doğrusal olmayan optik katsayılarının hesaplanmasında kullanılan oldukça verimli ve çok yönlü bir yöntemdir. Bu teknik, bilgisayar destekli sistem kullanılarak, malzemeyi z ekseni boyunca tarayarak doğrusal olmayan parametrelerin elde edilmesini sağlar. Optik karakterizasyonu bilinmeyen malzemelerin ölçümleri için Z Tarama yöntemindeki çok yönlülük ve ölçümlerdeki hassaslık, sonuçların doğruluğu ve etkinliği konusunda bilim adamlarına güven vermektedir. Malzeme örneği, odaklanmış laser ışınına yüzü düşey gelecek şekilde tutulur, örnek tutucu, lazer ışınının ekseni boyunca (z yönü) hareket edebilen doğrusal aktarım düzeneğinin üstüne yerleştirilir, örnek hareket edince; örnek tarafından iletilen ışığın miktarı doğrusal olmayan soğurma parametreleri için yeterli bilginin elde edilmesini sağlar. Karbon disülfürün (CS_2) doğrusal olmayan geçirgenlikle mesafe değişimi ince numune için (1 mm) kalınlığında kuartz hücre için elde edilen veriler Matlab programları kullanılarak grafiklerle ifade edilmiştir. Bu çalışma sayesinde uluslararası literatürde kabul edilen anizotroptik malzeme olan CS_2 için, elektromekanik otomatik kontrollü z-tarama deney sistemi kullanılarak, uluslararası düzeyde kabul edilen deney sonuçları ile uyumlu veriler başarı ile elde edilmiştir.

Anahtar Kelimeler: Z-Tarama Tekniği, Optik Geçirgenlik, CS_2, Opto-mekanik Sistemler, Mühendislik Uygulamaları.

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Characterization of Material Based on Local Resource Suitable for Applications in Sustainable Development in Algeria

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Abstract

Date palm residues are renewable and available in abundance in the world and specifically in Algeria. Though, they remain discarded with no economic utilization values. Several investigations have been carried out on the valorization of this natural resource in different domains. Petiole, Rachis, Fibrillium, Leaflets were the palm tree residues the most studied as composite reinforcements. This work reports the results of an experimental investigation on the properties and the feasibility of using these types of waste in manufacturing industrial particleboards panels. The results have shown that there is no significant difference in the morphological proprieties of the four types of residues. Yet, it is seen that the mechanical properties of Rachis and leaflets are better than those of other residues. On the other hand, Petiole and Fibrillium exhibit a high value of specific tensile strength and young modulus due to their low value of bulk density. Analysis of incorporating four granulometry taken from a mixture of the studied wastes in the polyester resin reveals that the wood particles whose diameter belongs to (0.8mm < d <1 mm) and the lengths on average between 5mm and 10 mm provide a medium wood panels with a good characteristics.

Keywords: Composite materials, natural reinforcements, date palm wood, characterization methods, wood particleboards.

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Influence of Process Parameters of Keyhole Plasma Arc Welding on the Depth-to-width Ratio on AISI 304HCu Joints

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Abstract

AISI304 HCu, superaustenitic stainless steel used in critical parts like superheaters and reheaters of advanced ultra super critical boilers. The joining of thick sections by low energy denisty process provides wider bead geometry with heterogenous microstructure. Inorder to avoid these issues selecting plasma arc welding, high energy density porcess provides homogenous microstructure by autogenous welding technique.Welding current, Plasma gas flow rate and Stand-off distance that govern the stablity in a keyholeThe welding current of 135 A, stand-off distance of 3 mm and plasma gas flow rate of 1.5 lm-1 provided complete penetrated joints without visual defects. The joints fabricated by incorporating the aforementioned parameters provided a maximum strength of 610 MPa which was 98 % to the strength of the base material with a maximum hardness of 230 VHN. The improved strength compared to the base material is because of the formation of δ-ferrite by diffusion of the weld puddle.

Keywords: Arc, Boiler, Force, Plasma, Penetration.

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Mechanism uf Nanofragment Formation in $A^{V}{}_{2}B^{VI}{}_{3}$

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Abstract

Ways to improve the degree of ordering of self-organized nanoobjects in $A^{V}{}_{2}B^{VI}{}_{3}$<*impurity*> systems are discussed. It is shown that, as a result of diffusion intercalation during crystal growth, it is possible to combine the methods of vertical directional crystallization with additional migration of atoms *(Cu, Ni, Zn, In, Se,)* into the interlayer space and defect cavities. Apparently, stress relaxation between quintets occurs through the mechanisms of elastic and plastic deformation with mass transfer and the appearance of screw dislocations, which affects the nature of folded-corrugated submicrostructures and the distribution density of nanoislands. Nanoislands and fold formations are evidenced by AFM images in 2D and 3D scales.

It is well known that the processes of elastic and plastic deformation of metal and semiconductor films on substrates during growth and mechanical loading are of interest in revealing the role of the periodic distribution of stresses and strains at the interface between two-layer systems. When such films are compressed on a pliable substrate, folds (corrugations) are formed on their surface and a coherent deformation of the substrate occurs. In the case of a rigid substrate, compressive stresses lead to elastic bending of the film with local or periodic delamination from the substrate. In this case, it is also necessary to take into account the movement of mass by plastic shear this process can determine the change in the shape of deformable bodies and their elements. The processes associated with the movement of atoms within the interlayer space of layered crystals can be called mass transfer. If there is a density gradient in the crystal or a mass gradient in it, excitations of cooperative displacements of atoms are possible. Shear displacements can develop along crystallographic planes, along grain boundaries, and also arise due to inhomogeneous slip along crack surfaces.

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Splitting of Some Energy Bands with Broadening of the Interlayer Distance in Doped Bismuth Telluride

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Abstract

As a result of the developed technology, an ordered array of nanoislands was formed in the process of self-organization on the Bi_2Te_3<Ni> *(0001)* plane. Penetrating mainly into the interlayer space impurities create bulk periodic superstructures, and consisting of arrays of nanoislands between packet of layers, which, as a result, move apart. The symmetry of the Bi_2Te_3 crystal forbids the mixing of the states $|s\rangle$ and $|d_z^{\eta}\rangle$ with $|p_x\rangle$ and $|p_y\rangle$, and $|d_z^{\eta}\rangle$ with the other d-states at high-symmetry points of the Brillouin zone, while mixing of all states is allowed at low-symmetry points. As a result, an increase in the potential barrier due interlayer broadening is accompanied by a shift and splitting ($\Delta E \sim 20$ meV) of some bands and the formation of an energy gap.

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Preparation of Ultrathin Transition Metal Oxide and Dichalcogenide Semiconductors Films Using Atomic Layer Deposition System for UV Photonic and Optoelectronic Applications

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Abstract

Due to its large electron affinity, broadband gap, variety of valence states, and layered structure, molybdenum oxides (MoO3) have attracted a lot of attention as one of the transition metal oxides that may be used in sensors, optics, catalysis, electronics, energy sources, and biological systems. Using an atomic layer deposition (ALD) technique using Bis(tbutylimido)bis(dimethylamino)molybdenum (VI) as a Molybdenum (Mo) source, we created ultra-thin Molybdenum oxide (MoO3) for this investigation. We prepared the films at temperatures of 100, 150, and 250 °C to better understand the impact of depositing temperatures. The ultra-thin films were then naturally collided after being annealed for 15 minutes at 600 o C in the air. From 1, 3, and 9 nm, various film thickens have been arranged. Energy-dispersion X-ray spectroscopy and scanning transmission electron microscopy were used to evaluate the morphological and elemental characteristics. The thickness of the films grows as the deposition temperature rises. We discovered extremely homogenous thin films with tiny particle sizes using atomic force microscopy. With an electron mobility of 9.80E+2 cm2/V, the thickness films exhibit n-type semiconductor characteristics. These results were analyzed and interpreted in the context of MoO3 surface evaporation, melting, and/or temperature-dependent atomic inter diffusion, providing new insight into the electrical uses of ALD MoO3. The application of atomically thin transition metal oxides in nonlinear electrical and photonic devices, as well as their integration, may be advanced by the findings of this study.

Keywords: Nanostructured thin films, Atomic layer deposition, MoO_3 ultrathin film, Optoelectronics

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Ultra-Sensitive Gas Sensor Based Fano Resonance Modes in Periodic and Fibonacci Quasi-Periodic Pt/PtS_2 Structures

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Abstract

In this paper, we studied the surface properties of adsorbed greenhouse gas molecules and their mechanism. For the first time, we introduced a novel composite based on metal/2D transition metal dichalcogenides (TMDs), namely; platinum/platinum disulfide (Pt/PtS_2) composite materials as ultra-sensitive greenhouse gas sensors for CO_2, N_2O, and CH_4 gases based on Fano resonance modes appeared at the interface between layers of structure. Our gas sensors were built based on the periodic and quasi-periodic phononic crystal structures of simple Fibonacci (F(5)) and generalized Fibonacci (FC(7, 1)) quasi-periodic phononic crystal structures.

The FC(7, 1) structure represented the highest sensitivity for CO_2, N_2O, and CH_4 gases compared to periodic and F(5) phononic crystal structures. Moreover, very sharp Fano resonance modes were observed for the first time in the investigated gas sensor structures, resulting in high Fano resonance frequency, novel sensitivity, quality factor, and figure of merit values for all gases. The FC(7, 1) quasi-periodic structure introduced the best layer sequences for ultra-sensitive phononic crystal greenhouse gas sensors. The highest sensitivity was introduced by FC(7, 1) quasiperiodic structure for the CH_4 with a value of 2.059 (GHz/m.s^{-1}). Further, the temperature effect on the position of Fano resonance modes introduced by the FC(7,1) quasi-periodic PhC gas sensor towards CH_4 gas has been introduced in detail. The results show the highest sensitivity at 70° C with a value of 13.3 (GHz/° C). Moreover, the highest Q and FOM recorded towards CH_4 have values of 7809 and 78.1 (m.s^{-1})$^{-1}$ respectively at 100° C.

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Kinetics of Boronized Tungsten Alloy

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Abstract

In this study, the diffusion kinetics of Tungsten alloy boronized in Ekabor-II powder at 1073, 1123 and 1173K temperatures for 3, 5 and 7 hours were investigated. The boride layer was characterized by optical microscopy and X-ray diffraction technique. X-ray diffraction analysis of boride layers on the surface of the steels revealed the existence of WB, WB_2, WB_3, CuO, Cu_2O and W_2B compounds. Diffusion calculations were made using Arrhenius and other equations from the obtained data. The growth kinetics of boride layers forming on the boronized Tungsten alloy was analyzed.

Keywords: Boride layer, Kinetics, Activation energy.

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Morphological and Chemical Analyses on the Cross-Sections of Biopolymer Nanocomposites in a FIB-SEM System

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Abstract

Multibeam platforms, consisting of Focused Ion Beam and Scanning Electron Microscope (FIB-SEM) columns are capable of performing simultaneous serial slicing and imaging processes using their ion and electrons beam sources. These tools also are equipped with nano/micro-manipulators, gas injection systems (GIS), and chemical analysis attachments; such as energy-dispersive spectra (EDS) [1]. In this study, biocompatible and biodegradable polymer composites were analyzed cross-sectionally in a dual-beam instrument for tracking the elemental, chemical and morphological distribution of hBN (Hexagonal Boron Nitride) nanoplatelets and AgNWs (Silver Nanowires) added to the polymer matrices. Typically, when instrumental parameters are not fully optimized during FIB processes, the original structures of soft materials tend to change; both chemically and physically; due to the material damage caused by ion irradiation. Accordingly, ion-patterning and electron-imaging parameters were to be precisely tuned for precise cross-sectional analysis. This work also examined the effect of the solvent (chloroform vs acetone) on the morphology and chemical distribution of PLA and PLA/AgNWs polymer composites. For FIB slicing and imaging analyses, the surfaces of the PLA and Chitosan composites with BN and AgNWs additives were first site-specifically carbon deposited using gas the GIS of the JEOL 4601F MultiBeam instrument. Then the cross-sections were formed by ion milling processes using gallium ion source at 30 keV ion energy and 1-10 nA ion currents. This was followed by HR-SEM imaging of the cross-sections in-line with the ion slicing, where changes in chemical and morphological distribution were observed depending on nano fillers and solvent.

Keywords: Biopolymer nanocomposites, FIB, Nanoprocessing, Cross-sectional analysis

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Valorization of Agricultural Waste: Extraction of Bioactive Compounds and Evaluation of Antioxidant Activity

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Abstract

The objective of this study is to valorize one of the discharges of olive industry: olive pomace. The first part of this study is devoted to the extraction and the dosage of total phenolics compounds in olive pomace and the extraction, determination of the physico-chemical and structural characterization of lignins. The second part aims to evaluate the antioxidant activity of the phenolic extracts and lignins obtained through various tests namely: trapping the free radical DPPH, iron reduction "FRAP" and bleaching test for β-carotene, in comparison with synthetic antioxidants vitamin C, BHA, BHT and gallic acid. Evaluation of antioxidant activity shows that all samples from olive pomace represent antioxidant properties at different levels; so as to extract lignin has a better reducing ability with respect to the extract of total phenols.

Keywords : olives pomace, phenolic compounds, lignins ,antioxidant activity.

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Engineering and Education in Lebanon

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Abstract

Education in Lebanon is given under the ministry of education and higher education. Education is given in Arabic, French and English as the mother tongue. Compulsory education is from the age of 3 to the age of 14. According to the United Nations human development index, the literacy rate in Lebanon is 93.9% as of 2014. This rate is 93.1% for men and 82.2% for women. Christians constitute the most educated part of the society. Lebanon offers a unique educational model that is a blend of European and American education models. Education in Lebanon consists of 5 stages. Preschool starts at the age of 3-4, the transition age to basic education is 6 years old and continues until the age of 14. Young people who have graduated from high school can use Arabic, English and French very well. Education at a Lebanese university young people have great advantages when they graduate, both with the education they receive and the diploma they have. For example, the Lebanese university ranked 100th in the Professional Reputation Index and is among the top universities globally and locally for engineering, technology, petroleum engineering, medicine and pharmacy majors, arts and design education. The American University of Beirut is one of the most important universities in the world. At the same time, the Lebanese university ranked 390 in the world for education in all engineering and technology departments, 201 in art design, 251 in pharmacy education, and 451 in medical education. After the civil war and economic crisis in Lebanon, great efforts are being made to ensure that the quality of education does not decrease and that education can reach higher standards.

Keywords: Higher education, University, Education language,

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Evaluation of Water and Sediment Quality of İnaltı Cave (Turkey) by Using Multivariate Statistical Methods

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Abstract

This study aimed to reveal the water and sediment quality, pollution status and their usability for living things in 10 stations for the first time in İnaltı cave, which has two underground ponds. Concentrations of 9 heavy metals (Cu, Pb, Zn, Ni, Mn, Fe, Cd, Cr, Al) and 1 metalloid (As) in taken samples were determined. These results were compared with limit values in Sediment Quality Guides (SQGs) and were analyzed further with different sediment evaluation methods. SQGs values revealed that the amounts of Cd and Ni are of concern. When the concentrations of metals in the water, only Al>Cr>Pb>Cu>As>Mn were found and were deemed not to pose any environmental risk. In addition, Anova, pearson correlation analysis, principal component analysis (PCA) and hierarchical clustering analysis were carried out to make the obtained data easier to understand and interpret. While designing the most appropriate action plans for water management, more clear and understandable information can be obtained by using these methods and interpreting the raw data. As a result of this first study in the cave, individuals belonging to the Niphargus genus, a member of the Malacostraca class, Niphargidae Family, were identified in the sediment.

Keywords: Fresh Water, Cave, Water Quality, Sediment Quality, Multivariate statistical analysis

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Evaluation of the Water Quality of Evrenye Stream (Turkey) with Water Quality Index and Multivariate Statistical Approach

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Abstract

In this study, it is aimed to determine the main pollutant sources and to reveal the water quality classes, in addition to the evaluation by using indexes and statistical methods, for the plain and clear expression of the spatial-temporal changes in the water quality of the Evrenye Stream, which is located in Kastamonu province in the Western Black Sea part of the Anatolian peninsula. Water quality data were obtained monthly (January 2021-December 2021) from 10 stations by considering 28 parameters. Cluster analysis (HCA) and principal component analyzes (PCA) have been applied to detect temporal and spatial variations of water quality. The parameters (PCA) constituting the main components of the water body are also used in the calculation of the water quality index (WQI). According to WHO and Turkey Surface Water Quality Regulation (SWQR), water quality was found to be in the very polluted water class only in terms of heavy metals (lead, copper, nickel, zinc). PCA was affected by four main factors explaining 83.69% of the total variance. In particular, point and non-point pollutants originating from heavy metals constitute the pollutant source of this stream. It is thought that mining enterprises located in the river basin may be responsible for this pollution. According to the cluster analysis, Winter and Spring seasons were found to be more similar than Summer and Autumn seasons. According to the spatial result of this analysis, this stream basin is divided into two as upper and lower basin. The result of the Water Quality Index (WQI), which is applied according to the annual average data values, is generally determined as quality water. While designing action plans for water pollution in stream basins, the use of these methods facilitates the interpretation and clearer interpretation of raw data. In the future freshwater management of the basin, monitoring is recommended.

Key words: water quality index, water quality, temporal-spatial variations, Hierarchical cluster analysis (HCA), principal components analysis (PCA).

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Microplastics in Freshwater Environment: First Assessment in Water and Sediment of Aksu Stream (Giresun / Turkey)

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Abstract

Plastic pollutants in aquatic ecosystems have been of wide interest and research since the early 1970s. However, compared to marine environments, the formation of microplastics in a tidal river system is largely unknown, especially in stream water and sediments. There are many studies in this field only for the marine ecosystem in our country. It is still a very new research topic for freshwater ecosystems. In this study, water and sediment samples were taken from 4 stations in Giresun, Aksu Stream, in triplicate. Microplastics (MP) were detected from the samples by the literature and categorized according to type, color and size using a stereoscopic microscope. Plastic types were identified using fourier transform infrared spectroscopy (micro-FTIR). One-way analysis of variance (ANOVA) was used to compare the results. This study adds to the growing evidence that MP contamination is very common even in freshwater ecosystems. In addition, this research provides a basis for future risk assessment studies

Keywords: Microplastic, fresh water, stream, sediment.

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The Effect of Borosilicate Glass Powder Additive on the Mechanical Properties of HA-TCP Biphasic Bioceramics

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Abstract

In this study, the change in mechanical properties of HA (Hydroxyapatite)-TCP (Tricalciumphosphate) two-phase bioceramics with the addition of borosilicate glass powder was investigated. As a starting raw material; calcium nitrate tetrahydrate, diammonium hydrogen phosphate and ammonia were used to adjust the pH.
Experimental studies consist of three stages. First, a mixture of HA and TCP was prepared and borosilicate glass powder was added to this mixture at certain rates (0%, 5%, 10%, 20% w/w). After the mixture was homogenized in a jet mill, it was shaped by pressing. Then sintering was carried out at different temperatures. Sintered samples were subjected to bending and compression strength tests according to their additive ratios and the change was examined. The increase of borosilicate glass powder additive showed improvement in mechanical properties.

Keywords: Hydroxyapatite, Tricalciumphosphate, bioceramics.

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Schiff Base Complexes Derived from Hexanediamine as Heterogeneous Catalysts

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Abstract

In this study, Two Schiff bases derived from hyxanediamine and their tin complexes were synthesized. Characterization of these products was effected by UV-Vis and IR spectrophotometry, 1H NMR, 13C NMR, melting point and thermal analysis (TGA) in dynamic air atmosphere. A theoretical study of the ligands and their complexes has been established. The stoichiometry of the various complexes was determined by applying the spectrophotometric molar ratio and continuous variation methods. Catalytic ability of synthesized complexes was investigated.

Keywords: Schiff bases, hyxanediamine, Heterogeneous Catalysts**.**

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Islamic Architecture

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Abstract

In general, 3 different styles of traditional Islamic residences can be identified in Saudi Arabia. These styles resulted from climatic and regional differences between them and different factors influencing these patterns and Urban Development. However different they may be, they are all related to Islamic values and local heritage. Hijazi Architecture is spread in the western part of the Kingdom, where we find the humid hot climate on the coast, which turns into a dry hot climate. Moving eastward inland, the existence of the city of Jeddah as a commercial port seems to have a great impact on the general public. Najd architecture is the architectural style in the desert regions of the Arabian Peninsula, which is characterized by the central region of Saudi Arabia, and this region has a hot and dry climate. Another architectural style is modern day architecture. This type of architecture may lead to the disappearance of traditional architectural styles and the loss of architectural identity in the kingdom.

Keywords: Architecture, Hijazi, Necd, Modern

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Chemical Synthesis of Calcium Aluminate Powders

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Abstract

In this study, it was aimed to make the chemical synthesis of calcium aluminate powders and to investigate the chemical production of CA phases. Simple phase, pure monocalcium aluminate (CaAl2O4) powders are chemically synthesized at low temperatures up to 900°C. Powders have a specific surface area of approximately 10m2/gr. CaAl2O4 hydration kinetics and morphology of hydrates are studied using electron microscopy techniques. Experimental studies based on this purpose consist of two parts. In the first part, aluminum nitrate Al(NO3)3.9H2O and calcium nitrate Ca(NO3)2.4H2O raw materials were used and solutions were prepared. Prepared solutions were heated at 500 ºC for 2 hours to remove water. The remaining samples were calcined at 900 °C for 3 hours. Then it was ground into powder and XRD and SEM analyzes of the samples were made. In the second part, the results of the experiment were analyzed. As a result, when the XRD peaks of the powders calcined at 900 °C for 3 hours were examined, it was observed that the CA phases (CA, C3A, C5A3) were formed.

Keywords: Chemical synthesis, Cement, CA cement, phases

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Investigation of CA and CA2 Phase Production By Sol-Gel Method

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Abstract

In this study, the main phases of calcium aluminate cement is aimed to investigate the chemical production of CA and CA2 phases. Experimental studies based on this purpose consist of two parts. Al (NO3)3 9.H2O and Ca (NO3)2. 4H2O were used as precursors. Solutions were prepared by using raw materials. After the mixing process, the water of the solutions was removed. The remaining samples were ground and sintered at 900°C and 1100°C for 8 hours. XRD analyzes of the sintered samples were made.

Keywords: Chemical synthesis, Cement, CA cement, phases

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Production of Water-Repellent Glasses by Sol-Gel Method

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Abstract

In this study ; laboratory glasses were first cleaned with isopropyl alcohol. Then, the chemical mixture (TEOS, Methyl alcohol, HCl, H2O) were prepared for water repellent property. It was applied to the laboratory glasses with the sol-gel dipping method. Between 1 and 5 layers was formed on the glasses. The coated glasses were then annealed in an oven at 500 °C for 30 minutes. After the surfaces of the annealed glasses were cleaned with water, they were visually examined (with methylene blue and KMnO4). In addition, the prepared mixture was pulverized and XRD analysis was carried out. Contact angle of surfaces was between 98-118 degree.

Keywords: Sol-gel, hydrophobic, lotus effect

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Photocatalytic TiO_2 Coating on Wall Tiles by Sol-Gel Method

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Abstract

In this study, tiles coated with TiO2 were produced by spraying method for anti-fogging, water-free and antibacterial applications. At the beginning of the study, the surface of the tiles cleaned with isopropyl alcohol was coated with TiO2 sol. The tiles were dried at room temperature and calcined at 980˚C for 1 hour. The samples obtained were sprayed with the prepared Ag ion containing TiO2 solution and left to dry at room temperature. The samples were kept under a fluorescent lamp (20 W) for 1 hour and 10 minutes. As a result, the changes in the coating were examined. Tiles covered with TiO2 film were produced successfully

Keywords: Sol-gel, hydrophobic, photocatalytic effect

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Production of Porous Glass

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Abstract

In this study, porous glass production possibilities were investigated by using glass shards and CaO, and CaCO3 raw materials as the main raw material. In this study, Güral Cam shards of different grain sizes (250 µm, 500 µm, and 1 mm) were mixed with different percentages of CaO and CaCO3 (5%, 15% and 20% w/w) and subjected to sintering at 950 °C.

In these experimental studies, the effect of additives in different sizes and in different proportions on the formation of porous glass was investigated. Accordingly, it was observed that the porosity ratio increased as the percentage of additives in the glass and the grain size structure of the glass increased. No binder was used in shaping and the mixture was mixed until the percentages were homogeneous, and it was filled into a special mold resistant to approximately 1050 °C and sintered at 950 °C. It has been observed that the additive and grain size used have great importance in the formation of pores.

Keywords: Porous glass, CaO, Calcium carbonate

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Photocatalytic TiO_2 Coating of Cotton Fabric By Sol-Gel Method At Low Temperature

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Abstract

In this study, Titanium dioxide coating was made on cotton fabric with sol-gel technique at low temperatures below 150 °C. A study was carried out on the photocatalytic activity of the titanium-coated fabric on its antibacterial properties. In the SEM analysis examination, it was observed that titanium dioxide was throughout the layer. The spherical Titanium microstructure could be observed throughout the diameter of 20 nm. The study was carried out on titanium-coated material with UV effect. As a result of XRD analysis, small phases were found throughout the Titanium coated layer.

Keywords: Photocatalytic, TiO_2, Cotton, Sol-gel

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Use of Cellulose Paper Waste in the Production of Porous Ceramics

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Abstract

Paperclay, which is prepared by adding pulped paper to any ceramic clay, has superior properties when compared to traditional ceramic clays.
It is easily prepared by adding different proportions of paper pulp into the liquid ceramic clay and mixing it. The fact that the cellulose fibers in the structure of the paper form a reticulated structure in the ceramic clay enables Paperclay to have much more durability than the main ceramic clay when wet and dry. With this durability, large works and wide plates can be easily carried out without being affected by the negative effects such as cracking and turning and works that have not been baked for biscuits can be easily transported from one place to another. Thanks to its ability to be added in any situation, unlike traditional ceramic clays, one wet and one dry or two dry or even one biscuit-fired and the other wet or dry piece can be added to each other. Due to these features, the drying of the work does not create a problem. It is also possible to repair the work if it breaks or cracks at any stage. Since the paper is destroyed by burning during firing, the ceramic body becomes lighter. The ceramic body has the characteristics of the main ceramic clay that enters the Paperclay mixture after firing. Paperclay, which is an extremely talented material with all these features, gives ceramic artists the chance to realize their projects, which are limited by the characteristics of traditional ceramic clays, more freely. They can make any changes they wish on their work, in any case, wet or dry.

Keywords: Paperclay, porous ceramic, sintering

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Production and Characterization of SnO_2-Doped ZnO Nanofibers by Electrospinning Method

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Abstract

Today, with the developing technology, the effects of nanotechnology have reached high levels. As example of nanotechnology, nanofibers are also involved in many industrial areas. Nanofibers are generally defined as structures with fiber diameters of 50-500 nanometers. Since nanofiber production is difficult. But various methods have been developed. Among these, the electrospinning method is a common method.
In this study, the production of tin-doped zincoxide ($ZnO.SnO_2$) nanofibers and the characterization of the produced fibers were investigated using the electrospinning method. As electrospinning method parameters in experimental studies; The effect of flow rate, applied voltage and distance between collector and nozzle was investigated.

Keywords: nanofiber, electrospinning, $ZnO.SnO_2$

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Production and Characterization of Al-Doped ZnO Nanofibers by Electrospinning Method

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Abstract

With the advancement of technology, interest in micro-structures rather than macro-structures in the world has been attracted, and subsequently nanotechnology has been developed and the transition to nano-scale production has been made. Nanofibers, which generally have diameters less than one micron, have found many uses today, thanks to their high surface area, high porosity, flexibility and rigidity. For nanofiber production; Various techniques such as fibrillation, electrospinning, sea-islet and meltblowing have been developed.
In this study, aluminum doped zinc oxide nanofibers were produced by electrospinning method, which is one of the most commonly used methods in nanofiber production, and the effect of aluminum additives on the morphology of these fibers was observed.

Keywords: nanofiber, electrospinning, nanotechnology

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The Effect of Rare-Earth Based Additives on the Ablation Resistance of ZrB_2-SiC Composites

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Abstract

The effect of different rare-earth oxide additives (Lu_2O_3, Yb_2O_3 and Eu_2O_3) on the sintering, microstructure evolution, phase composition and mechanical properties of ZrB_2 – 25vol. % SiC ultra-high temperature ceramics was investigated. No significant effect of different rare-earth oxides on the room temperature properties (hardness, fracture toughness, Young's modulus, flexural strength) was observed. On the other hand, the ablation resistance of the materials up to ~ 2700°C was significantly improved (by ~ 30%) when the Yb_2O_3 additive was used. The improved ablation resistance was attributed to the in-situ formation of $Yb_2Zr_2O_7$ pyrochlore phase on the surface of the materials during the ablation tests. Therefore, this additive was selected for further investigation. The effect of various amounts of Yb_2O_3 and $Yb_2Zr_2O_7$ additives (2, 5, and 10 wt.%) on the densification, room temperature mechanical properties and ablation resistance of ZrB_2 – 25vol. % SiC composites prepared by two different approaches (reactive SPS sintering vs. non-reactive SPS sintering) was investigated. The use of reactive SPS approach helped to significantly decrease the sintering temperature from 2000°C to 1600°C. At the same time, the lower temperature and the in-situ formation of phases resulted in a significantly finer microstructure of ZrB_2 – 25vol. % SiC when sintered by reactive approach. This led to the improved room temperature mechanical properties and the ablation resistance of the materials. No significant deterioration of the room temperature properties was observed even after the addition of 10 wt.% of Yb_2O_3 and $Yb_2Zr_2O_7$ additives. On the other hand, their use resulted in the significant improvement of the ablation resistance, as the linear ablation rate of ZrB_2 – 25vol. % SiC with 10 wt.% of Yb_2O_3 and $Yb_2Zr_2O_7$ was 3x lower when compared to the reference ZrB_2 – 25vol. % SiC.

Acknowledgement
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Production of PMMA-Doped Al_2O_3-SiO_2 Composite Material Produced by Sol-Gel Method

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Abstract

The progress of technological developments continues with an increasing momentum day by day. Especially with the development of space technology, it was necessary to develop new material groups to be used in this technology. One of these developed material groups is composite materials. Simply put, composite material is the combination of two or more materials to form a material with better properties. In this study, alumina-silica composite was produced by sol-gel method. In the study, by changing the silica ratio in the alumina matrix of the material, two different silica concentrations were obtained. These two different materials were calcined at 1500°C, then the materials were characterized.

Keywords: Composite, Mullite, Sol-gel process

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Diyatomit İle Kontrollü İlaç Salımı

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Özet

Bu çalışmada endüstriyel bir hammadde olan diyatomitin zenginleştirilmesi ve devamında ilaç taşıyıcı bir sistem olarak değerlendirilmesi araştırıldı. Kalsinasyon ile zenginleştirilmiş diyatomit üzerine difenhidramin yüklemesi yapıldıktan sonra ilaç salım profili incelendi. Yapılan karakterizasyon testleri (BET, XRD, FT-IR) ile diyatomitin zenginleştirildiği ve diyatomit üzerine difenhidramin yüklemesinin başarılı olduğu tespit edildi. In vitro salım profili simüle edilmiş mide sıvısı ile hazırlanan salım ortamında tespit edildi. Bunun için USB aparatus 1 yöntemi (basket yöntemi) kullanıldı. Elde edilen sonuçlara göre, diyatomitin %90 oranında ve 60 dk boyunca kontrollü ilaç salımı yaptığı tespit edildi.

Anahtar kelimeler: Diyatomit, zenginleştirme, difenhidramin, kontrollü ilaç salımı.

Production of Silicone Coated Hydrophobic Glass Surfaces

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Abstract

With the advancement of technology, interest in micro-structures rather than macro-structures in the world has been attracted, and subsequently nanotechnology has been developed and the transition to nano-scale production has been made. Nanofibers, which generally have diameters less than one micron, have found many uses today, thanks to their high surface area, high porosity, flexibility and rigidity. For nanofiber production; Various techniques such as fibrillation, electrospinning, sea-islet and meltblowing have been developed.
In this study, aluminum doped zinc oxide nanofibers were produced by electrospinning method, which is one of the most commonly used methods in nanofiber production, and the effect of aluminum additives on the morphology of these fibers was observed.

Keywords: nanofiber, electrospinning, nanotechnology

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Influence of Zinc Borate on the Flame Retardancy of Polymer Composite

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Abstract

The use of fire retardants in order to prevent the occurrence of fire is an application that is becoming more common day by day. The most effective application area of fire retardants is polymers. fire retardants; Bromine added fire retardants, melamine-based fire retardants, metal hydroxides, antimony oxide and zinc borate are grouped into five groups. Zinc borate has gained a large share in the fire retardant market in recent years and this share is increasing day by day.
In this study, zinc borate was mixed into the polymer at different rates and homogenized. It was then left to dry at room temperature for one day. Then, the UL-94 test was made ready by carefully cutting our samples to be 3 cm - 9 cm. The samples were characterized by XRD, SEM, EDX, Elemental mapping.

Keywords: Polymer, flame retardancy, zinc borate

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Physical Properties of B_4C-Doped MgB_2 Superconductor

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Abstract

The primary aim of this study was to investigate the effects of B_4C doping material on the electromagnetic behaviour of MgB_2 in bulk form. Bulk MgB_2 samples were prepared by stoichiometric, elemental powder mixing and compaction followed by heat-treatment at 850°C for one hour. In the precursor sample we have been taken Mg, B along with B_4C according to the formulae $MgB_{2-5x}(B_4C)_x$ (x=0,0.04,0.1,0.2,0.4) .XRD was employed to confirm phase formation and microstructural variations. According to XRD results in all the samples except the sample with x=0.4, MgB_2 appears as dominant phase. Also, in all samples there is a presence of small MgO peak.The magnetic moment versus temperature indicated that the transition temperature of MgB_2 sample was around 38 K and transition temperature is decreasing systematically with the increase in doping from x=0 to x=0.04. We can also conclude that there is drastic effect of lattice contraction on Tc suppressing by carbon doping through B_4C.It has been noticed that the critical current density Jc of x=0.04 doped sample is enhanched under higher magnetic fields in comparison to pure MgB_2 and it is about $1.5\times105 A/cm^2$ at 15K measurement temperature under 3T magnetic field. From Kramer's plot, it is concluded that B_4C doping results in enhancement of the pinning strenght in MgB2 bulk samples.

Keywords: Superconductivity, MgB_2, B_4C doping.

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A Theoretical Study of the Effects of Electric Field, Hydrostatic Pressure, and Temperature on Photoionization Cross-Section of a Donor Impurity In (Al,Ga)N/AlN Double Triangular Quantum Wells

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Abstract

The aim of this research is to analyze the influence of various factors on the photo-ionization cross-section in (Al,Ga)N/AlN double triangular quantum wells. Using the finite difference method, the effects of the electric field, hydrostatic pressure, temperature, and Ga concentration were investigated within the effective mass and parabolic approximations. Our findings show that the photo-ionization cross-section (PICS) is highly dependent on all the variables under consideration. The optical spectra were blue-shifted with increasing electric field and pressure and red-shifted with increasing temperature and impurity displacement far from the center of the structure. Furthermore, it was found that changes in gallium content and impurity position can increase the PICS amplitude. A comparison of the obtained results with the existing literature as a limiting case of the reported problem is also provided, and excellent agreement is found.

Keywords: Photoionization cross section; Shallow-donor impurity; Temperature, Pressure; Electric field, Finite difference method

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Microwave Absorption Properties of Neoprene Based Rubber Filled with Magnetic Fillers

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Abstract

Electromagnetic wave is a self-propagating wave in space that has electric and magnetic components oscillating at right angles to each other and to the direction of propagation. They are also in phase with each other. According to the wave frequency electromagnetic radiation is classified into eight types in order of increasing frequency: (1) radio waves, (2) microwaves, (3) terahertz radiation, (4) infrared radiation, (5) visible light, (6) ultraviolet radiation, (7) X-rays and (8) gamma rays. Microwaves are electromagnetic waves with wavelengths ranging from 1 mm to 1 m, or frequencies between 300 MHz and 300 GHz. The microwave range includes ultra-high frequency (UHF) (0.3–3 GHz), super high frequency (SHF) (3–30 GHz), and extremely high frequency (EHF) (30–300 GHz) signals.The demand of today's society on the reliability of electronics and the growth of radio frequency radiation sources, which emit electromagnetic energy in the high frequency bands increase rapidly. However, many problems have occurred along with it, which are a misoperation of precise electronic equipment and leak of secret information occurred by a leakage of electromagnetic wave. Electromagnetic radiation emanating from a wide variety of sources-electronic circuitry, radar, radios, power lines, electric motors, fluorescent lights-adversely affects circuit performance is generally termed electromagnetic interference (EMI). It is basically electrical in nature and becomes an unwanted source of environmental electronic pollution. Thus, the electromagnetic compatibility (EMC) and electromagnetic interference (EMI) are becoming a serious problem, and much attention has been paid towards finding suitable microwave absorber to solve this problem. It is essential to find suitable rubber matrix and suitable filler or system of fillers for developing microwave absorbing composites. Most of the microwave absorbers consist of a dielectric polymer matrix and specific functional fillers with high values of dielectric and magnetic loss. The latter must have high values of the imaginary part of the complex dielectric permittivity and magnetic permeability that absorb high frequency energy. Rubber matrix has to insulate the filler particles completely from each other. Rubber is an effective host medium for ferrite materials as they are light, easy to fabricate, and with desirable mechanical properties.In this study, microwave absorbing properties of neoprene rubber filled with carbonyl iron and ferrite functional fillers were investigated. Secondly, resistance against ozone degradation characteristics were also examined.

Keywords: Microwave absorption, rubber, carbonyl iron, ferrite, ozone resistance

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Fabrication of Antibacterial and Antifungal Nanofibers Infused with Essential Oil for Surgical Mask Applications

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Abstract

In this study, cellulose acetate (CA) polymer was first mixed with boric acid and then lemon oil, niaouli oil, palmarosa oil, and patchouli oil to form a solution. The solutions obtained were transformed into nanofibers considering the electrospinning parameters and deposited on the melt blown layer of the surgical mask. The resulting nanofibers were analyzed by scanning electron microscopy (SEM) and images were obtained. Fiber structure, diameters, distribution and homogeneity were determined from the obtained SEM images with the help of the Fibraquant program. Characteristic peaks were obtained for cellulose acetate, boric acid and essential oils in the FTIR analysis applied to the solutions. Antibacterial effects of the obtained solutions were tested on Staphylococcus aureus bacteria by using disk diffusion method and it was determined that cellulose acetate solution with boric acid and lemon oil added has the highest antibacterial effect. Again, in the antifungal test using the disk diffusion method, it was determined that cellulose acetate solution with boric acid and palmarosa oil was effective against the growth of Aspergillus flavus and Penicillium notatum molds.

Keywords: Electrospinning, nanofibers, antibacterial.

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Synthesis of Antibacterial and Antifungal Nanofibers Infused with Silver-Doped Essential Oil for Surgical Mask Applications

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Abstract

In this research, 6 solutions were obtained by adding silver nitrate, pelargonium oil, eucalyptus oil, citronella oil and cypress oil to cellulose acetate (CA) solution. Nanofibers were produced from these solutions using the electrospinning method. The meltblown layer, which is the middle layer of the surgical mask, is covered with the produced nanofibers. Morphological analysis of nanofibers was determined by scanning electron microscopy (SEM). The diameter, homogeneity and distribution of nanofibers were determined with the Fibraquant program. Fibraquant program analysis results showed that nanofiber diameters were between 100 nm and 800 nm. The initially prepared solutions were characterized by FTIR analysis, antifungal and antibacterial activity. Characteristic peaks were obtained for cellulose acetate, silver and essential oils in FTIR analysis. According to the results of antibacterial analysis against Staphylococcus aureus bacteria, cellulose solution with silver nitrate and eucalyptus oil was found to have the highest antibacterial activity. According to the antifungal test performed on Aspergillus flavus and penicillium notatum mushrooms, cellulose acetate solution with silver nitrate and pelargonium oil was found to have the highest antifungal activity.

Keywords: Nanofiber, Silver, Essential oils, Antifungal, Antibacterial, Surgical mask.

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Influence of Nb Microalloying on 316L Stainless Steel Powders

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Abstract

Microalloying is an important technique used to improve the properties of some materials using small quantities of critical and expensive elements like Nb, Ti, V, etc. Stainless steel powders (316L) were mixed and homogenized with Nb powders in a turbula mixer for 1 hour. Three compositions were produced having 0.4, 0.6 and 0.8 % Nb. Mixed compositions were pressed at 600 MPa in die with specific shape to obtain specimens for toughness test. The green parts were sintered at 1120 °C, endothermic gas 0.3 %C in a belt furnace with a speed of 7m/min. Macrostructure of sintered parts was studied using a light microscope Olympus GX30. Toughness and Brinell Hardness were determined. The microscopic analysis revealed the precipitation of niobium carbides to the grain boundaries. For the samples with 0.8 % Nb it was observed an increasing in hardness about 10%, while for 0.4 % Nb no influence was observed compared with an etalon specimen. A smaller influence was produced by the microalloying with niobium of 316L stainless steel powders; an increment of 7 % was measured in the case of 0.8 % Nb.

Keywords: Niobium, 316L, Stainless Steel, Microalloying.

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The Importance of Surface Coating Methods

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Abstract

Surface coating processes are carried out intensively today. In general, the aim is to bring the surface properties of the metals that can be coated to a better position than they have. While some coatings are for decorative purposes, some coatings protect the surface properties against corrosion, abrasion or scratching. When we look at the methods of coating metals, it is seen that many methods and techniques are used. Each coating method has a separate purpose. Although some of the surface protective properties are the same, it is seen that there are different aspects when their mechanical or physical and chemical properties are examined. Even if the coating types are the same, the coated substrate material also plays a major role in the coating process. After coating, the adhesion strength between the coating material and the substrate material to be coated is also of great importance.

Keywords: Surface, Coating, Materials, Methods

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Characterization of a Ceramic Filament Made from SiC and Recycled LDPE Powders

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Abstract

Additive Manufacturing is the process of joining materials particles to produce objects from 3D model data, usually layer upon layer. Fused Deposition Modelling (FDM) is intensively used to print parts using polymer filaments. Recently, the industry focused on printing parts by FDM using metals or ceramics materials. The aim of this study is to obtain a ceramic filament for FDM. SiC particles were combined with a polymeric binder consisting of recycled LDPE or recycled LDPE/new LDPE. Binders were produced with 100 % recycled LDPE, 25:75, 50:50, and 40:60 recycled: new LDPE. Ratio between binder and SiC was 50:50 volumes. Filaments were produced using an in-house extrusion device. The viscosity of binders and feedstocks was determined using a Rheotest viscosimeter. Tensile tests were conducted to achieve the mechanical characteristics of produced filaments.

Keywords: FDM, LDPE, Additive Manufacturing, Recycling.

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Development and Characterization of Super Hydrophobic Coatings for Engineering Applications

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Abstract

Corrosive and erosive wear is a major issue in most of the engineering applications around the globe. Hence, this study offers a proposed solution i.e. hyderophobbic coatings to deal this problem. Hydrophobic coatings are excellent water repellent coatings that give us the edge of increasing a material's service life. Different ceramic coatings are already being used but are difficult process as well as costly. Polymeric coatings are the best suited alternate to ceramic hydrophic coatings as such materials readily available, easy to process and extremely cost efficient. In this study, some of the polymers such as Ethylene vinyle acetat (EVA), Poly vinyl butyral (PVB), poly vinyl alcohol (PVA), and polystyrene (PS) based coatings were developed. Allthough, these coatings do not exihibit good mechanical properties but are exteremly hydrophobic and excellent adhesion with the substrate. Mechanical properties of such coatings are enhanced with the addition of Graphene nanosheets. It was observed that the addition of graphene (up to 0.5 wt%) in EVA enhanced the hydrophobicity by 30% and adhesion strength to substrate by 100%, while for PVA the hydrophobic properties were enhanced by 51% and adhesion strength to substrate by 125%. Similarly enhancements were also observed for PS and PVA. Lastly, the optimized coatings were applied to Al substrate to mimic the real life applications and it was observed that the Al's overall hydrophobicity and adhesion was enhanced drammetically. Thus, this was concluded that these polymeric coatings are ideally suited for various engineering applications, such as protective coating on solar panels to increase their life, protective coating on automotive, wear resistant coating on eyeglasses etc.

Keywords: Hydrophobic, PVB, Coating, EVA, Graphene, PS, Self-Healing, PVA, Characterization

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Facilely Prepared Starch-Based Ionic Conductive Hydrogel, Batteries, and Self-Powered Sensors with Strain-Sensitivity

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Abstract
Natural biopolymers, from sustainable biomass resources, are biodegradable and biocompatible and thus have huge potential for developing biomedical or transient systems. However, the processing of biopolymers is challenging (e.g. poor solubility in common organic solvents and high viscosity) due to the dense hydrogen bonds existing in them. We have recently found that metal chloride salt solutions of certain concentrations can effectively destruct the granules of high-amylose maize starch (HAMS) biopolymer and allow for the easy preparation of starch-based hydrogels.

Here, we report an entirely starch-based hydrogel for flexible electronics including strain-sensitive batteries and self-powered wearable sensors. This biodegradable hydrogel is only based on natural HAMS, $CaCl_2$, and glycerol, and the preparation method is green and facile (namely stirring at 70 °C for 1 h). This hydrogel is highly stretchable, flexible, reprocessable, and self-healable. Based on this hydrogel, we developed a galvanic cell-type Zn-Cu battery (composed of one starch-based hydrogel additionally incorporated with zinc powder and the other with $CuCl_2$ and copper powder), which has a voltage of 0.81 V and its output current positively correlated with compression deformation. Based on this Zn-Cu battery, a self-powered (SP) wearable sensor was further constructed, which has high sensitivity (1.5371 kPa^{-1}) even under weak compression stress. This SP sensor can be used to detect human activities involving small strain such as wrist pulse and throat vibration with strong, clear and stable signals. Considering the easy processability, cost-effectiveness, high strain-sensitivity, robustness, and greenness of the starch-based hydrogel and electronics, their application prospect is foreseen.

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The Effect of Stud Walls on Dynamic Characteristics of Steel Building

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Abstract

Today, the use of steel structures is increase in the world. It is known that steel structures are affected by earthquake effects like all other building types. In addition to this situation, steel structures are affected by environmental vibrations like all other objects. Due to all these effects, steel structures may lose their bearing capacity over time. In this case, it causes very dangerous results such as collapse of the structure. Various proven retrofit methods are available to solve such problems. The use of stud walls is one of these retrofit methods. It has been proven in many studies that the stud walls reinforcement method is quite common. In this study, the effects of stud walls in a sample steel building are revealed by making modal analysis using the finite element method. In particular, the structure vibration periods and free vibration mode shapes of the first 5 modes are discussed in detail. Thus, the positive effect of stud walls on the rigidity of the structure has been more clearly demonstrated. In the light of all this results, the method of stud walls can be used in the reinforcement of steel buildings.

Keywords : Steel buildings, Stud walls, Finite element method, Dynamic parameters, Retrofitting

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Analysis of Steel Water Tank under the Effect of Temperature Change with FEM

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Abstract

Today, the use of steel structures is quite common. With the increase in the use of steel structures, it is necessary to consider some negative aspects of steel structures. In the main cases where steel structures are most adversely affected, there is the effect of temperature. Especially in the steel elements used in infrastructure systems, it is necessary to act more sensitively. Steel water tanks are an example of this situation. In this research, a model steel water tank was designed with the SAP2000 program to examine the behavior of a steel water tank under the influence of temperature changes. The water tank was exposed to three different temperatures (0°C, 50°C, and 100°C) and the behavior of this model steel water tank was studied and the values were observed under the influence of each temperature. The values of moments, forces, maximum potentials, and displacements under each temperature were compared. In the light of the results obtained, it is seen that as the temperature increases, the values of moments, stresses and shears increase and the amount of deformation and displacement that occurs with increasing temperature increases.

Keywords: Steel Water Tank, Temperature Effect, Deformation, Finite Element Method

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Is Nuclear Technology Disaster for Future ?

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Abstract

Nuclear science even its only 100 years age, managed to become one of the most important generic technology and now it is used in a variety of different fields.
In this work nuclear technology will be introduced, its importance will be detailed and its negative effect in future will be discussed.

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Wet-Method-Multilayer (WMM) for Fabricating of Low-Cost Multilayer Piezoelectric Ceramics Actuators

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Abstract

Multilayering is a viable and sustainable technology to optimise properties for many types of functional ceramics. In this study, a simple methodology was developed which is heretofore referred to as the wet-method-multilayers (WMM) which is low cost and simple. The method was developed primarily to resolve issues of delamination which dogged early attempts at multilayering using conventional processing. In the WMM method, a small quantity of tape-cast solvent was brushed onto each layer which could then be laminated by applying a gentle manual pressure. This procedure resolved problems of delamination, typically encountered by more conventional lamination methods. Typically, 10 to 16 layers were pressed together with screen printed Pt electrodes in between. From each stack, four samples were cut with extra green tape then pressed onto the sides of the laminated sample to further minimise delamination. This methodology would open the new doors to prepare ceramic multilayer devices economically by avoiding vacuuming, CIP, hot pressing, and fast-sintering followed by drying/binder-burnout stages with lowest possible chances of delamination defects.

Keywords: Wet-Method-Multilayering, green-tape, delamination, low-cost, Fast-sintering

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Functionally Graded Silicon Nitride with Improved Bioactivity Prepared by Tape Casting

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Abstract

The aim of the work was to develop new Si_3N_4-based functionally graded materials (FGM) with improved bioactivity for bone tissue ingrowth. Such materials were prepared by combination of tape casting and sintering. The FGM materials consisted of 36 layers (tapes) with functionally graded material composition prepared by tape casting process: the dense part of FGM was formed by 12 layers (tapes) having the composition 93wt.% Si_3N_4 and 7wt.% Y_2O_3. Then, the intermediate part was formed by combining 3 different compositions (each formed by 4 layers; in total 12 layers/tapes) with a gradient increase of the amount of bioactive $CaSiO_3$ additive in the direction from the dense part towards the porous part of FGM: 85wt.% Si_3N_4 + 8wt.% $CaSiO_3$ + 7wt.% Y_2O_3; 85wt.% Si_3N_4 + 11wt.% $CaSiO_3$ + 4wt.% Y_2O_3; 85wt.% Si_3N_4 + 15wt.% $CaSiO_3$. Finally, the porous part of FGM was formed by the 85wt.% Si_3N_4 + 15wt.% $CaSiO_3$ composition with a gradient increase of the content of pore-forming agent (graphite) towards the outer surface of FGM. The individual layers/tapes were stuck together using a cold isostatic pressure (CIP). The effect of various pressures during CIP process on the formation of FGM materials was investigated. After CIP, the FGM materials were placed in a furnace to burn out all binders at the temperature of 850°C in air. The final materials were sintered using pressureless sintering in nitrogen atmosphere in the temperature range of 1500°C – 1700°C. The effect of sintering temperature, different heating/cooling rates, and different dwell time was investigated. The adhesion of the individual layers and the final materials composition were investigated using SEM and XRD analysis, respectively.

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$BiFeO_3$ And $AgNBO_3$ Based Dielectric Energy Storage Ceramics

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Abstract

Global demand for portable electronics and electric vehicles has stimulated the development of energy storage systems with greater power and energy densities. As a kind of vital energy storage devices, the dielectric capacitor has gained a great deal of interest due to its high-power density and rapid charge-discharge rate, and so plays a crucial role in decarbonizing the economy of the twenty-first century. Discovering lead-free, less harmful materials has been a significant scientific and technical problem.
Relaxor ferroelectric and antiferroelectric lead-free ceramics are promising candidates due to their relatively small remanent polarizations and high dielectric breakdown strengths. Novel tailored dopant strategies in BiFeO3-SrTiO3 (BF-ST) relaxor ferroelectrics have been proposed in our work: i) Nb-doping to increase resistivity by eliminating hole conduction and promoting electrical homogeneity and ii) alloying with a third perovskite endmember, BiMg2/3Nb1/3O3 (BMN), to reduce polar coupling without decreasing the average ionic polarizability. Using these strategies, ultrahigh energy density of 15.8 J cm-3 for BF-ST has been attained in multilayer ceramics. In addition, we combined theoretical calculations, in-situ synchrotron X-Ray diffraction and transmission electron microscopy data to give evidence to the underlying mechanisms that underpin optimization of energy storage density (6.5 J cm-3) in AgNbO3-based antiferroelectric ceramics from micro to macro scales. It is the first observation of a field induced ferrielectric phase and the first time to propose 4 principles for the design of high energy density in antiferroelectric ceramics. These two works both define clear engineering guidelines to design lead-free ceramics for high energy density capacitors to support sustainable development.

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Development of Silicon Nitride with Bioactive Surface Using Oxyacetylene Flame

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This work was aimed to develop a bioactive surface of silicon nitride by the thermal treatment using an oxyacetylene flame. It is essential to study different additives that could improve the bioactive properties of Si_3N_4 without reducing its mechanical properties. Dense silicon nitride-based ceramics were sintered with various combination of sintering additives to enhance their bioactivity and maintain their good mechanical properties. The samples were sintered using spark plasma sintering at different conditions to ensure the best combination of mechanical properties, such as relative density, Young's modulus, hardness, and fracture toughness. The samples were subsequently treated with an oxyacetylene flame to develop a bioactive layer on the external surfaces. In addition, the effect of other parameters, such as nozzle distance, temperature, and exposure time on the thickness and pore distribution of the bioactive layer were evaluated. The capability of treated samples to form hydroxyapatite was assessed by scanning electron microscopy. In vitro testing of human pulmonary fibroblast cells (MRC5) was used to determine potential cytotoxicity and cell viability of the specimens. The heat-treated samples presented good cell viability, demonstrating that the oxyacetylene flame treatment can create a bioactive surface suitable for living tissue.

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In-Situ Synthesis and Characterization of B_4C-TiB_2 Composites

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Abstract

The aim of the work was to prepare boron carbide composites with the addition of 10 vol.% TiB_2 by reactive field assisted sintering technology, in which the final materials were obtained by the in-situ reactions between B_4C, TiO_2, and carbon black. The combined effects of electric current and in-situ reactions (accompanying by the formation of a significant amount of CO gas) resulted in the formation of electrical arcing. At the same time, a significantly different electrical resistivity of TiB_2 than that of B_4C caused a significant local overheating at the TiB_2/B_4C interfaces, which led to a partial decomposition of B_4C grains to form graphene nanoplatelets. When one of the two factors was absent during the preparation process, e.g. during hot pressing without electric field, or non-reactive field assisted sintering of B_4C and TiB_2 powders, no formation of graphene nanoplatelets was observed. The work also proposed an innovative approach to prevent the decomposition of B_4C grains from happening, by the use of so-called isolated reactive field assisted sintering. A short dwell time (30 s after a degassing step of 6 min) and the uniform distribution of fine TiB_2 grains were the main advantages of isolated SPS over the reactive hot press and SPS processes, respectively.

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Wetting and Joining of SiC-Based Advanced Ceramics by $ZrSi_2$ Alloy

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Abstract

In this work, the wettability and interfacial reaction of molten $ZrSi_2$ alloy on the monolithic SiC and C_f/SiC composite surfaces, and joining of SiC ceramics with $ZrSi_2$ filler were investigated. The results show that a significant evaporation of Si from the liquid affected the wetting behavior of the alloy when tested in a vacuum at 1670°C. The better wetting and spreading of the alloy over the SiC surface was observed under argon atmosphere and the wetting angle decreased significantly. The molten alloy reacted with the SiC surfaces to form ZrC reaction layer, while the remaining unreacted $ZrSi_2$ alloy with some free Si was observed in the solidified alloy. Afterwards, the studies were utilized to join SiC and C_f/SiC ceramics with $ZrSi_2$ alloy as the filler. The alloy was applied on the joining surfaces of the materials in the form of slurry, then the pressure-less and pressure-assisted joining were performed for the sake of comparison. The thickness of the interlayer was controlled by the weight of the slurry and the effect of different thickness of the interlayer was studied. The phase and microstructure analysis of the joints revealed that due to the formation of the ZrC layer on the interface, the interfacial bonding between the SiC and the interlayer was significantly improved.

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Sol-jel Yöntemiyle Kumaşların Antibakteriyel Kaplanması

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Abstract

In this study, Titanium dioxide coating was made on cotton fabric with sol-gel technique at low temperatures below 150 °C. A study was carried out on the photocatalytic activity of the titanium coated fabric on its antibacterial properties. In the SEM analysis examination, it was observed that titanium dioxide was throughout the layer. The spherical Titanium microstructure could be observed throughout the diameter of 20 nm. The study was carried out on titanium coated material with UV effect. As a result of XRD analysis, small phases were found throughout the Titanium coated layer.

Keywords: Photocatalytic, TiO_2, Cotton, Sol-gel

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