THERMAM 2016

3rd International Conference on Thermophysical and Mechanical Properties of Advanced Materials

1 – 3 SEPTEMBER 2016

Izmir / Turkey

Abstracts Proceedings

Organizers:

Dokuz Eylul University
Department of Mechanical Engineering
Izmir - Turkey

University of Rostock
Institute of Technical Thermodynamics
Rostock, Germany

Azerbaijan Technical University
Department of Heat and Refrigeration
Bakü - Azerbaijan

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Prof. Dr. Ismail Hakki Tavman (Dokuz Eylul University, Izmir – Turkey)

Full Professor in Mechanical Engineering Department of Dokuz Eylul University, Izmir – Turkey, and Head of Energy Section in the same department. He graduated from Mechanical Engineering Department of Bosphorus University - Istanbul in 1973. He obtained his M.Sc. and PhD degrees in Mechanical Engineering, respectively in 1983 and 1987 from ENSAM- Paris (Ecole Nationale Supérieure d'Arts et Métiers- Paris, France). His PhD thesis is on "thermal anisotropy of polymers as a function of their molecular orientation".
He was visiting professor and researcher in several universities in different countries: Ulm University – Germany; Department of Mechanical Engineering COPPE/Escola Politécnica – Federal University of Rio de Janeiro, UFRJ Rio De Janeiro – Brazil; University of Reims Champagne-Ardenne, Laboratoire GRESPI – Thermomécanique Faculté des Sciences, Reims, France; University of Florence Mechanical Engineering Department – Florence – Italy; Polymer Institute, SAS, Dubravska - Bratislava, Slovakia.
Prof. Ismail Hakki Tavman has been invited as keynote speaker in many International Conferences.
Presently his fields of research are: Thermal and mechanical properties of conductive polymer Nanocomposites; Nanofluids- Characterization; 3-omega method for measuring thermal diffusivity and conductivity; Measurement of thermal diffusivity by Laser Flash Technique; Thermal analysis of TFT-LCD TV Panels.
He has: 45 papers publications in SCI indexed journals; 11 book chapters, 88 papers published in the proceedings of international conferences and 50 papers published in the proceedings of national conferences. He was director or co-director in different international (3) or national research projects (12). He was advisor in 25 MSc and 4 PhD thesis.

Prof. Dr.-Ing. Egon Hassel (Curriculum Vitae Prof. Dr.-Ing. habil. Dipl. Phys. Dr. h.c.)

HE was borned in 1955 in Germany, near Bad Kreuznach, Rheinland Pfalz.1962-74 Mathematical-Natural-Science High-school, Degree earned: Allgemeine Hochschulreife. 1974-76 German Army service. 1976-82 Physics study at RWTH Aachen University, Germany, Degree earned: Diplom Physiker. 1982-86 PhD work at RWTH Aachen University, Germany, Faculty of Mechanical Engineering, Institute of Technical Thermodynamics, Prof. Dr.-Ing. K. F. Knoche, theses: "Coherent anti-Stokes-Raman spectroscopy for study of IC engine knock". 1982-89 Research assistant at RWTH Aachen University, Germany, Faculty of Mechanical Engineering, Institute of Technical Thermodynamics, Prof. Dr.-Ing. K. F. Knoche. 1989-96 Habilitation about "Laser optical measurements for combustion studies" at TU Darmstadt, Germany, Faculty of Mechanical Engineering, Institute of Energy- and Power Plant Technology, Prof. Dr.-Ing. J. Janicka. 1989-99 Research assistant at TU Darmstadt, Germany, Faculty of Mechanical Engineering, Institute of Energy- and Power Plant Technology, Prof. Dr.-Ing. J. Janicka. 1999- Full professor, chair, Institute of Technical Thermodynamics, Faculty of Mechanical Engineering and Ship Building, University of Rostock, Germany. Nov. 2012 honorary doctorate from Azerbaijan Technical University in Baku

Prof. Astan Shahverdiyev (Azerbaijan Technical University)

Prof. Astan Shahverdiyev was born on 15 February 1947 year in Fizuli city of Azerbaijan Republic. He graduated from Azerbaijan Oil and Chemistry Institute on 1970 year. A.N. Shahverdiyev was post-graduated student of Azerbaijan Technical University on 1978-1981 years. On 1981, he defended his PhD thesis and got the candidate of technical scien ces degree. On 1982 year, he was elected to the assistant position of Department "Heat techniques and heat installations" of Azerbaijan Technical University. On 1992 year, he defended his doctor of science thesis at the Moscow Energy Institute and got the doctor of technical sciences degree. On 1994 year, A.N. Shahverdiyev got Professor degree. On 1995 year, he was elected member of New-York Academy of Sciences. On 2001 year, Prof. Shahverdiyev was elected to the position - head of the department: "Heat and Refrigeration Techniques".

Prof. A.N. Shahverdiyev published more than 400 scientific publications, monographs, patents and lecture book. On 1998-2002 year A.N. Shahverdiyev was co-ordinator of Ozone Centre in Azerbaijan office of UN. He is member of Renewable Energy working group of EURONETRES of UNESCO.

Prof. A.N. Shahverdiyev participated with the scientific presentations in the international conferences and symposiums halted in USA, Canada, India, Egypt, Swiss, Germany, UK, Italy, The Nederland's, Portugal, China, Turkey, Slovak Republic, Greece, Uzbekistan, Belorussia, Ukraine, France, Russia etc. He was member of Azerbaijan Republic in the various congresses organized by UN and UNESCO.

Prof. A.N. Shahverdiyev is honor of Z. Tagiyev scientific medal. He can speak English and Russian languages.

Prof. A.N. Shahverdiyev member of Parliament of Azerbaijan Republic from 2005 year.

Married, has 2 daughters.

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PREFACE

3rd International Conference on Thermophysical and Mechanical Properties of Advanced Materials

Thermodynamics is a very fascinating scientific field which has to do with many different phenomena in nature and technique. As an interesting example we can regard climate change which at the moment is on the agenda of many political decision makers and scientists. Climate change is partly caused by the emission of the carbon dioxide molecule to the atmosphere from farming, from technical combustion in energy technique and transport and from many other human related processes. The heat transfer processes in the atmosphere clearly have to do with thermodynamics. On the other hand, measures to reduce human impact on the environment, like CCS, carbon capture and storage, from combustion also involve thermodynamics processes. To solve and handle thermodynamics problems one needs "Thermophysical and Mechanical Properties of Advanced Materials". One example is the possible capture of carbon dioxide from atmosphere or exhaust gases in ionic liquids. To make this technically feasible data for the thermophysical property of solution of carbon dioxide in the advanced material of an ionic liquid are needed.

Within this conference we want to bring together international scientists and engineers who work in the very broad field of "Thermophysical and Mechanical Properties of Advanced Materials". This is a very interesting and modern research field. It covers experimental and theoretical new results for thermophysical properties, new measurement techniques and the their applications, molecular modeling with new theoretical insights, applications which show the improvement done with the described research for thermophysical properties and mechanical properties all for materials like nanofluids, nanocomposites, alternative solvents, metals, alloys, ceramics, composites, etc. These subjects cover fundamental and applied research and engineering aspects.

We want to foster lively discussions and future international collaborations on this important and stimulating field with this conference.

We choose the venue of the conference as a holiday resort with all the amenities of such a place in a very nice surrounding and with the possibility to excursions to historically interesting tourist sites like Ephesus.

We wish you a very pleasant, joyful, interesting and stimulating conference "THERMAM 2016" in Izmir, Turkey.

The Organizing Committee

SCIENCE PROGRAMME

PROGRAMME

THERMAM 2016 - 3rd Thermophysical and Mechanical Properties of Advanced Materials

1-3 September 2016, IZMIR, TURKEY

1 September Thursday					
09:00 18:00	Registration				
10:30 11:00	Opening Session				
Keynote Session 1					
11:00 11:30	Thermophysical properties of ionic liquid + methanol solutions *Javid Safarov*				
PARALLEL SESSIONS 1 – Chairs Necdet Sağlam & Metin Özer					
SALOON A				SALOON B	
11:45 12:00	64	Impacts of Material Types and Fabrication Methods to Enhance Near Field Radiative Transfer for Energy Harvesting Devices *Elif Begum Elcioglu, Tuba Okutucu Ozyurt and M. Pinar Menguc*		141	Viscoelastic and mechanical properties of olive pomace filled Polypropylene (PP) composites *Nusret Kaya, Metehan Atagür, Orhan Akyüz, Yoldaş Seki, Mehmet Sarikanat, Özgür Seydibeyoğlu, Mücahit Sütçü and Kutlay Sever*
12:00 12:15	113	Modeling of Thermodynamic and Thermopysical Properties of Refrigerant Mixtures *Mustafa Turhan Coban*		109	Preparation and Mechanical Properties of Graphene Oxide (GO)/ Polyvinyl Chloride (PVC) Composites *Ferda Mindivan*
12:15 12:30	125	Effect of B element ratio on thermal properties of NiMn40Co5Sb10-xBx alloys *Yildirim Aydogdu, Ayse Aydogdu, Mediha Kök and Zehra Deniz Yakıncı*		6	Optimization of weld parameters of hot plate welded ABS+PC blends by using the Taguchi experimental design method *Aydın Ülker, Nahit Öztoprak, Sami Sayer and Çınar Yeni*
12:30 14:30	LUNCH				
14:30 15:30	PARALLEL SESSIONS 2 (SALOON A - SALOON B)				
PARALLEL SESSIONS 2 – Chairs Zehra Deniz Yakıncı & Mediha Kök					
14:30 14:45	73	Thermal Properties Of Polypropylene Homopolymer Materials Filled For Different Grain Size Colemanite *Tülin Sahin, Ece Cengiz Yücel and Senol Sahin*		48	Experimental Investigation on Bolted Natural Fibre Reinforced Composites *Cemal Koçhan and Çiçek Özes*

14:45 15:00	105	Thermal conductivity of polymeric materials - accuracy of different measurement techniques *Helena Weingrill, Wolfgang Hohenauer, Katharina Resch, Liane Gnegeler and Christoph Zauner*		85	Effect of Divided Core on The Shear Performances of Textile Reinforced Foam Core Sandwich Composites *Tuba Alpyildiz, Hüseyin Erdem Yalkin and Bulent Murat Icten*
15:00 15:15	67	Thermal Performance of a Multi-Holed Brick Considering Different Hole Shapes and Hole Arrangements *Murat Çağrı Uludaş, Muslum Arici and Hasan Karabay*		86	Impact Response of Perforated Foam Core Sandwich Composites: Effect of Core Thickness *Bulent Murat Icten, Huseyin Erdem Yakin and Tuba Alpyildiz*
15:15 15:30	134	Parametric Transient Analysis of Thermal Insulating Plaster for Exterior Wall *Tuğçe Pekdoğan and Tahsin Başaran*		120	The Change of Thermal and Microstructure Properties of Cu-Based HTSMAs *Muhammed Al-Dalawi, Fethi Dagdelen and Mediha Kok*
15:30 16:30	COFFEE BREAK with Poster Session A (P1-P25)				
16:30 17:15	PARALLEL SESSIONS 3 (SALOON A - SALOON B)				
PARALLEL SESSIONS 3 – Chairs Metin Özer & Mustafa Turhan Çoban					
16:30 16:45	118	Thermal Procedure effects of CuAlNiTi shape memory alloys *Mediha Kök, Fethi Dağdelen, Sait Kanca and Ayşe Aydogdu*		77	Effect of Polymer Concentration on the Release Characteristics of Thyme Oil Microcapsules *Bugra Ocak and Meltem Karagozlu*
16:45 17:00	121	Ageing Temperature and Ageing Time Effects on Thermal Properties of CuAlCr Shape Memory Alloy *Zehra Deniz Yakıncı, Mediha Kök, Ayşe Aydoğdu and Yıldırım Aydoğdu*		133	Synthesis and Characterization of Zn0.98Al0.02O Powders by Sol-Gel Method *Enes Kilinc, M. Abdullah Sari, Fatih Uysal, Erdal Celik and Huseyin Kurt*
17:00 17:15	27	Calorimetric and densimetric measurements for modelling elimination of carbon dioxide by dissolution in aqueous systems: Data for geological sequestration *Barbara Liborio, Alejandro Moreau-Ortega, Nicole Nénot, Karine Ballerat-Busserolles and Jean-Yves Coxam*		137	Obtaining High Quality Surface for Micro Texturization of Silicon Wafer *Erhan Kayabaşı, Hüseyin Kurt and Erdal Çelik*
2 September Friday					
Keynote Session 2					
09:30 10:00	Nanofluids for Enhanced Heat Transfer: Potential Applications and Barriers *Alpaslan Turgut*				
10:00 11:00	COFFEE BREAK with Poster Session B (P26-P50)				
11:00 12:30	PARALLEL SESSIONS 4 (SALOON A - SALOON B)				

PARALLEL SESSIONS 4 – Chairs Alpaslan Turgut & İsmail Hakkı Tavman					
SALOON A				SALOON B	
11:00 11:15	9	Thermal Performance of Ag-Water Nanofluids in a Single Phase Natural Circulation Mini Loop *Halil Doğacan Koca, Serkan Doğanay and Alpaslan Turgut*		2	The Measurements of Thermophyscial Properties of High Density Polyethylene/Graphene Nanoplatelets Nanocomposites by Planar Disk Transient Method *Tuba Evgin, Vlastimil Boháč, Ismail Tavman, Alpaslan Turgut, Igor Novak and Maria Omastova*
11:15 11:30	8	Effect of loop aspect ratio on the performance of nanofluid based single phase natural circulation mini loops *Ziya Haktan Karadeniz and Alpaslan Turgut*		32	Grain size effect on fatigue life of WC-Co 40 mainly used in cold forging tools *Barış Tanrıkulu, Ramazan Karakuzu, Umut İnce and Emrah Kılınçdemir*
11:30 11:45	59	The influence of the nanoparticles Al2O3 additives in isopropyl alcohol and propylene glycol on the liquid and solid phases heat capacity *Taras L. Lozovsky, Igor V. Motovoy, Olga Ya. Khliyeva and Vitaly P. Zhelezny*		75	Effect of TiO2 and Cr2O3 on properties of CaO-Na2O-SiO2 glasses *Nedjima Bouzidi, Siham Aissou, L Cormier and Djoudi Merabet*
11:45 12:00	5	Enhancing the thermal conductivity of oils by using MWCNTs as additive *Abdulkareem Alasli, Tuba Evgin and Alpaslan Turgut*		149	Performance Analyses of Environmentally Friendly Low-GWP Refrigerants *Ayşe Uğurcan Atmaca, Aytunç Erek, Orhan Ekren*
12:00 12:15	4	Numerical Study on Nanofluid Based Flat Plate Solar Collector *Alper Mete Genç, Mehmet Akif Ezan and Alpaslan Turgut*		146	Oxidation Behavior of 316L Stainless Steel at High Temperatures in Air *Hakan Us, Tushar K. Ghosh and Sudarshan K. Loyalka*
12:15 12:30	25	Phase Equilibria in Fluid Mixtures Embedded with Graphene Genealogic Tree Nanoparticles *Viktoriia Karnaukh and Viktor Mazur*		147	Oxidation Behavior of Structural Material Incoloy 800H alloy for High Temperature Reactor Systems *Hakan Us, Tushar K. Ghosh and Sudarshan K. Loyalka*
12:30 14:30	LUNCH				

14:30 15:30	PARALLEL SESSIONS 5 (SALOON A - SALOON B)				
PARALLEL SESSIONS 5 – Chairs Ziya Haktan Karadeniz & Khenafi-Benghalem Nafissa					
14:30 14:45	84	Thermochromic and solvatochromic behavior of formally divalent phosphorus compounds in solutions *Alexander Kornev*		129	Optimization of chemical vapor deposition process parameters for aluminizing *Umutcan Ertürk and Bilge İmer*
14:45 15:00	82	Thermodynamic Properties of Redox-Isomeric Cobalt Complexes with O-Semiquinonic Ligands *Alla Arapova, Michael Bubnov, Nina Skorodumova and Natalia Smirnova*		131	Aluminide Coating Simulations *Mustafa Tarık Boyraz, Umutcan Ertürk and Dr. Bilge İmer*
15:00 15:15	60	Performance Evaluation of Carbon Fiber Assisted Cabin Dryer During the Drying Process of Strawberry Slices *Ömer Faruk Çokgezme, Mutlu Çevik, Deniz Döner, Serdal Sabanci and Filiz İçier*		38	Investigation of the Mechanical Bonding Effects on Mechanical Performance of the Adhesively Bonded Composite Materials *Yunus Emre Kahvecioglu and Yusuf Arman*
15:15 15:30	145	Evaluation of Rheological and Thermal Properties of Dietary Fibre Enriched Gluten Free Doughs *Ayşegül Koralay, Buket Amca, Seher Kumcuoğlu, Neslihan Bozdoğan and Şebnem Tavman*		12	The experimental and numerical investigation of fracture behavior of woven-fabric-reinforced glass/epoxy laminates including different crack geometries *Evren Meltem Toygar and Fuat Gezici*
15:30 16:30	COFFEE BREAK with Poster Session C (P51-P74)				
16:30 17:15	SESSION 6 (SALOON A)				
SESSION 6 – Chair İsmail Hakkı Tavman					
16:30 16:45	68	Effects of Talc Additions on Thermal Conductivity and Decomposition of Rigid Polyurethane Foams *Bilal Aydoğan and Nazim Usta*			
16:45 17:00	71	Investigation the fire behavior of rigid polyurethane foams filled with talc *Bilal Aydoğan and Nazim Usta*			
17:00 17:15	7	Ferrofluid Applications on Micro Pumping Systems *Serkan Doganay, Alpaslan Turgut and Levent Cetin*			

1 September 2016 Thursday		
POSTER SESSION A (P1-P25)		
P1	45	Separation of low aromatic hydrocabons from mixed aromatic aliphatic hydrocarbon streams using ionic liquids *Ouahiba Tafat-Igoudjilene, Naima Chouireb and Joao Coutinho*
P2	47	Current-Voltage Characteristics of Schottky Barrier Diode Dependent on Temperature *Ahmet Kürşat Bilgili and Metin Özer*
P3	54	Thermal shock resistance of Mullite resulting from kaolin and tri-hydrated alumina *Malou Zahra and Hamidouche Mohamed*
P4	119	Electron concentration effects of CuAlNi shape memory alloy *Fethi Dağdelen, Mediha Kök, Soner Buytoz and Ayşe Aydogdu*
P5	123	Thermophysical properties of 1-butyl-3-methylimidazolium hexafluorophosphate at wide range of state parameters *Javid Safarov, Khagani Suleymanli, Abdulgani Aliyev, Astan Shahverdiyev and Egon Hassel*
P6	124	Carbon Dioxide Solubility in 1-Octyl-3-methylimidazolium Tetrafluoroborate at High Pressures and Temperatures *Christopher Sperlich, Aygul Namazova, Rena Hamidova, Javid Safarov, Ismail Kul, Astan Shahverdiyev and Egon Hassel*
P7	130	Analysis of Heat-Spreading Capability of encapsulated Annealed Pyrolytic Graphite Cores *Eric Monier-Vinard, Minh-Nhat Nguyen, Najib Laraqi, Valentin Bissuel and Olivier Daniel*
P8	148	Thermophysical properties of Çeşme Seawater sample *Abzar Mirzaliyev and Javid Safarov*
P9	51	Roughness of the punch in contact with steel sheet *Khennafi-Benghalem Nafissa, Zahri Abdeliamine and Hamidouche Mohamed*
P10	52	Effect of wear on microhardness changes of alloy steels rubbing on X200Cr13 steel under dry conditions *Khennafi-Benghalem Nafissa, Hamidouche Mohamed and Zahri Abdliamine*
P11	65	Study of the Dynamic Properties of Protection System Against the Vibration *Benali Farouk, Merouani Abdelhak and Faci Abdelazziz*
P12	108	Characterization of Powder Metallurgy-Processed AZ 91/Nickel-Coated Graphite Composites *Harun Mindivan*
P13	41	A Numerical Study on the Mixed Convection of Laminar Nanofluid in a Vertical Channel *Bouhezza Aicha*
P14	44	Effect of TiO2 nanoparticles dispersed in different base fluids on the heat transfer *Boukerma Karima and Kadja Mahfoud*
P15	15	Fundamental Equations of State for 1-, 2-Butanol *Boris Grigoriev, Igor Alexandrov and Anatoly Gerasimov*
P16	19	Correlations of Viscosity And Thermal Conductivity of 1-, 2-Butanol *Igor Alexandrov, Boris Grigoriev and Anatoly Gerasimov*
P17	31	Experimental phase diagrams for the system of crosslinked network Poly (2-PhenoxyEthylAcrylate) / solvent *Tewfik Bouchaour, Nouara Benmessaoud and Ulrich Maschke*

P18	39	Hopping Conductivity and Thermo-Emf in the Tlfe1-Xgaxs2 Solid Solutions *Solmaz Mustafaeva*
P19	46	Thermodynamics of Low-Dimensional Ferrimagnetic TlCoS2 *Elmira Kerimova, Agadil Abdullaev and Solmaz Mustafaeva*
P20	50	Analytical study of natural sandstone from local region using non-destructive techniques *Mounia Benyamina and Merzoug Bouchear*
P21	56	Characterization of transparent glass-ceramic (MAS) developed by the controlled crystallization process. *Chorfa Abdellah, Belkhir Nabil and Ariane Khalissa*
P22	72	Characterization of CuIn1-xGaxSe2 thin films co-evaporated for photovoltaic solar cells. *Drici Abdelaziz, Bouraoui Ali, Amara Abdelaziz, Berredjem Yamina,Laskri Amina, Boulouma Amor and Hamrouni Achraf*
P23	89	Estimation of the Combined Standard Uncertainty of Thermal Diffusivity Measured With Flash Methods *Wolfgang Hohenauer*
P24	97	Flows in a Differentially-Heated Rotating Free Surface Cylinder *Malika Imoula and Rachid Saci*
P25	132	Characterization of the thermal contact parameters in an airplane braking system using inverse methods *Jean-Gabriel Bauzin, Nicolas Keruzore, Arnaud Gapin, Jean-Frederic Diebold and Najib Laraqi*
2 September 2016 Friday		
POSTER SESSION B (P26-P50)		
P26	101	Tribological Behaviours of ZA27/Graphene nanocomposites *Emre Deniz Yalçın, Aykut çanakcı, Fatih Erdemir and Temel Varol*
P27	102	Wear investigation of Al2024/SiC composites by response surface Methodology *Fatih Erdemir, Aykut çanakçı, Emre Deniz Yalçın, Temel Varol and Serdar Ozkaya*
P28	3	Effect of fluid flow rate on the thermal performance of a nanofluid based system for electronics cooling *Emre Elbasan, Hakan Özdeniż and Alpaslan Turgut*
P29	115	Relationship Between the Surface Roughness and the Glass Erosion Duration *Smail Benterki, Chabane Bousbaa and Abdelaziz Faci*
P30	127	Influence of the sand mass and grain size on some properties of a soda lime glass subjected to sandblasting *Abdelaziz Faci, Nourredine Bouaouadja, Farouk Benali and Smail Benterki*
P31	111	Thermal decomposition of barium strontium squarate hydrate *Chahrazed Trifa, Hayet Anana and Chaouki Boudaren*
P32	43	Thermodynamic study on the CVD formation of boron nitride *Kaan Soysal and Ömer Faruk Murathan*
P33	88	Complex of 3A,6A-DIAZA-1,4-Diphosphapentalene with Lewis Acids. Thermal Investigation *Alla Arapova and Alexander Kornev*
P34	98	Thermal Decomposition of Pb (H2O) (C4O4) *Chaouki Boudaren, Amira Bouhali, Chahrazed Trifa and Thierry Bataille*

P35	126	Effect of B element ratio on thermal properties of NiMn40Fe5Sb10-xBx alloys *Yildirim Aydogdu, Ayse Aydogdu, Zehra Deniz Yakinci and Mediha Kök*
P36	138	Thermal stability of food grade w/o emulsions *Hülya Çakmak and Sebnem Tavman*
P37	10	Investigation by a Genetic Algorithm of Fiber-Matrix Interface Damage of Bio-Nanocomposite Sisal/Graphite-Epoxy. *Mokaddem Allel, Beldjoudi Nadir, Doumi Bendouma, Alami Omar and Zeddour Brahim Mohamed Zahera*
P38	35	Correlations of Microstructure and Mechanical Properties of High Frequency HF Melting Ti-Al Alloys System *Salim Boulkhessaim and Abdelhak Fekrache*
P39	90	Thermal, Mechanical, and physical Properties of composite Polyethylene /Polystyrene /wood flour: Influence of Free Quenching *Leila Latreche and Nacereddine Haddaoui*
P40	92	Mechanical, physical and Thermal Properties of composite recycled polyoxymethylene/ calcium carbonate (POM recyc)/CaCO3) *Leila Latreche and Nacereddine Haddaoui*
P41	110	The effect of (Al2O3.4SiO2.H2O-Na-Ca-Mg)-AlCrNi phase material on the turbine blades wear *Mokhtar Bounazef and Hélène Ageorges*
P42	117	Improvement of the Mechanical Properties of the Steel 16NC6 by Cementation *Yassamine Abdedaim, Abdelouhab Redjechta and Kamel Loucif*
P43	53	Study of the Silver and Copper Nanoparticles Diffusion in the Soda Lime Glass *Chorfa Abdellah, Belkhir Nabil, Ariane Khalissa, Rubio Fausto, Rubio Juan*
P44	24	X-ray powder diffraction and dielectric study of Pb0.96Ba0.02Ca0.02[(Zr0,52 Ti0,48)0.94(Zn1/3,Ta2/3)0.03(ln1/3,Sb2/3)0.03]O3 sintered ceramics *Zelikha Necira, Ahmed Boutarfaia, Malika Abba, Noura Abdessalem, Hayet Menasra, Karima Bounab and Abdelhek Meklid*
P45	33	Synthesis of Si and Ba added Bi2212 Superconductors *Boussouf Nora, Benhamideche Chahrazed, Kalkoul Nadira and Mosbah Mohamed Fayçal*
P46	34	Zr addition on Bi (Pb) 2212 superconductor *Sahraoui Hada, Boussouf Nora, Benhamideche Chahrazed and Mosbah Mohamed Fayçal*
P47	36	Investigations of co-existence region in lead zirconate-titanate solid solutions: X-ray diffraction studies *Abdelhek Meklid, Ahmed Boutarfaia, Zelikha Necira, Malika Abba and Hayet Menasra*
P48	57	HF application in the optical glass polishing *Aounallah Brahim, Khelaf Ikram, Belkhir Nabil and Chorfa Abdellah*
P49	70	Study of residual stresses of identation in the glass *Leila Younes, Mohamed Hamidouche and Khaled Ayadi*
P50	83	Non destructive testing for the study of the biological environments. (Detection of the tumoral cells). *Hichem Chorfi and Ayadi Khaled*
2 September 2016 Friday		
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CONTENTS

KEYNOTE ABSTRACTS

Thermophysical Properties of Ionic Liquid + Methanol Solutions

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Ionic liquids and their organic solutions are claimed to be useful as heat transfer fluids in absorption refrigerating and solar heating systems, in separation technologies, as liquid crystals, templates for the synthesis of mesoporous, nano-materials and ordered films etc. Such wide interval of applications of ionic liquids requires high quality thermophysical properties. In this work, we will present the new (p,ρ,T) properties 1-ethyl-3-methylimidazolium methanesulfonate [EMIM][$MeSO_3$] and methanol mixtures at the wide range of temperature [T=(273.15 to 413.15) K] and pressures up to p=60 MPa with an estimated experimental relative combined standard uncertainty of $\Delta\rho/\rho$= ±(0.01 to 0.08) % in density, which were investigated using a Anton-Paar DMA HPM vibration-tube densimeter. Such wide rang of measurements were carried out at the first time.

The density of [EMIM][$MeSO_3$] and methanol mixtures at ambient pressure were measurements using the Anton-Paar DSA 5000 density and sound of speed measurements. The heat capacities at ambient pressure $c_p(p_0,T)$/J·kg^{-1}·K^{-1} and various temperatures were measured using the differential scanning calorimeter Pyris 1.

An empiric equation of state for fitting of the (p,ρ,T) data of [EMIM][$MeSO_3$] and methanol mixtures has been developed as a function of pressure and temperature. This equation together with the heat capacity values was used for the calculation of the thermophysical properties of IL, such as isothermal compressibility $\kappa_T(p,T)$/MPa^{-1}, isobaric thermal expansibility $\alpha_p(p,T)$/K^{-1}, thermal pressure coefficient $\gamma(p,T)$/MPa·K^{-1}, internal pressure $p_{int}(p,T)$/MPa, specific heat capacities $c_p(p,T)$/J·kg^{-1}·K^{-1} and $c_v(p,T)$/J·kg^{-1}·K^{-1}, speed of sound $u(p,T)$/m·s^{-1}, isentropic expansibilities $\kappa_s(p,T)$ at high pressures and temperatures, in which the (p,ρ,T) data of [EMIM][$MeSO_3$] and methanol mixtures were measured.

The excess molar volumes V_m^E /cm3·mol-1 of the investigated mixtures were calculated using the pure components and mixture properties.

Keywords: Ionic Liquid, Methanol, Vapor Pressure, Density

Dr. Javid Safarov was born on 10 December 1965 in Urkmezli village of Qazax region of Azerbaijan. He graduated from the Azerbaijan Technical University with honours and began to work at the department of "Heat and Refrigeration Techniques" of this university. He worked on 2005-2006 years as research co-worker at the University of Erlangen-Nürnberg of Germany. He is research co-worker at the department "Technical Thermodynamics" of University of Rostock from 2006 and has permanent position in this University from year 2011. Javid Safarov is member of the German group of the International Association for the Properties of Water and Steam (IAPWS). He has honoured the DAAD (2002 and 2006), Alexander von Humboldt (2003-2004, 2007) and JSPS-Japan (2004) fellowships. Dr. Javid Safarov is the co-author of 1 book, 1 monograph, 4 lecture book and more than 250 publications in the journals and conferences. He is leader of the research group of "Thermophysical properties of fluids" at the department "Technical Thermodynamics" of University of Rostock. Research field: Thermophysical properties of substances. He is one of leading person in the research field of investigations of the Thermophysical properties of fluids in the world. Married, has 3 daughters.

The Use of Transient Methods for the Investigation of the Thermal Properties of Materials Correlated with the Changes of the Structure Caused by Effects of Different Origin

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The talk will be concentrated on the use of the transient methods in material research. The list of transient techniques available at the thermophysical laboratory at the department of metals at the IP SAS will give a picture about thermal properties research possibilities of this class of techniques. The most papers published within our laboratory were on the Pulse Transient Method based on ideal model with some simple correction factors introduced to eliminate possible disturbing effects. Recent work is continuing with development of new models for this method. The new models for PTM were extended for different sample geometries as well as for various initial and boundary conditions, as well as for different disturbance effects. The new method published recently is the Planar Disc Transient Method where the heat source as well as the thermal probe is united in a form of full disc made of metallic sheet. Some experimental results given in the talk will illustrate the wide scale of use in practice and the sensitivity on various effects connected with the material structure changes of various kind. The correlation of the structure change due to sintering process with measured values of the thermophysical parameters will be illustrated on three types of electro-technical ceramics. The next effect is the release of the mechanical stress during the relaxation of the compacted powder. The influence of rising composite filler content will show the correlation with the increase of thermal transport properties. Some of the transient methods were modified for the use as the secondary sensor for the monitoring of thermal transport in porous media in the presence of moisture in pores. Here the effect of thermal transport increase when increasing the moisture content in pores of the material is used. A brief information on calibration of the transient sensors as the secondary sensors for monitoring of the moisture content will show the application of secondary techniques in long time monitoring of the temperature-moisture regime in the field conditions.

Keywords: Thermophysical Properties, Pulse Tenasient Method, Transient Techiques

Recently **Vlastimil Bohac** is active in the field of transient techniques. He was the leader of the several projects concentrated on the development of transient methods and investigation of material properties by them. He was a project leader of several projects. The last ones were: “Study of rock properties and investigation of structural and textural characteristics in correlation with thermophysical and physico-mechanical properties”, “Development and testing of physical models for the pulse transient method”, “Study of thermal-insulation properties of low thermal conductive materials”. He was the chairmen of the THERMOPHYS conference in the years 2012, 2013 and 2014. He is editorial board member of the International Journal of Engineering and Allied Sciences (IJEAS) He is a member of the scientific committee of the MEASUREMENT and THERMOPHYS conferences. He makes revision reports on scientific projects for academic grant agency. He reviewed manuscripts for 11 scientific journals and 3 conferences. He is the author of 40 articles in refereed in Web of Science. Research fields: Transient methods – uncertainty analysis of models, methodology of experiment optimization. Thermal characterization of materials – measurement of basic thermophysical parameters, the structure change effects, influence of atomic rearrangement, stress relaxations. Technology – optimization of technological processes, ceramic sintering, polymer curing, concrete stiffening. Influence of the moisture content on transport properties in porous materials – monitoring of the moisture-temperature regime in porous media, combined transport.

Modeling of Radiative Properties of Irregular Open Cell Solid Foams/Recent Advances

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Dominique Baillis is a Professor of the INSA Lyon Thermal Science Centre (CETHIL). She received the PhD degree in 1995 from INSA (National Institute of Applied Sciences) Lyon, France and the Professor degree in 2007 from the same institution. Her research interests have been focused on experimental identification and theoretical modeling of thermal radiative and conductive properties of diverse disperse systems such as advanced thermal insulations, fibrous materials, porous ceramics, foams, and nanoporous materials.

Nanofluids for Enhanced Heat Transfer: Potential Applications and Barriers

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Nanofluids are colloidal mixtures which consist of nano-sized particles suspended in a base fluid. The particles can be high conductive metals, metal oxides or carbon based materials. Nanofluid term has attracted researchers' attention and many nanofluid studies have been conducted for last two decade. Available literature indicates that nanofluids have many potential applications such as solar collectors, electronics cooling, thermal energy storage, car radiators, refrigerators and heat exchangers. Although, nanofluids have diverse potential applications, a real nanofluid application has not been concreted yet. This study will discuss the potential nanofluid applications and barriers behind lacking of a real application.

Keywords: Nanofluid, Potential Application, High Conductive, Nanoparticle

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Alpaslan Turgut, associate professor in Mechanical Engineering Department of Dokuz Eylul University, Izmir – Turkey. He obtained his PhD degree in Mechanical Engineering from Dokuz Eylul University, in 2010. He was visiting researcher in Multiscale Thermophysics Lab. and Thermomechanic Lab. in University of Reims, France; RAPSODEE Centre – CNRS 5302 Ecole de Mines Albi, University of Tolouse, France; Slovak Academy of Sciences Polymer Institute, Bratislava, Slovakia. His current research topics are thermophysical characterization of materials, mainly nanofluids, phase change materials with graphene additions, polymer composites, electronics cooling. He has authored or co-authored more than 40 papers in indexed journals and conference proceeding. He has participated in more than 10 scientific research projects as a director or researcher.

ABSTRACTS

Impacts of Material Types and Fabrication Methods to Enhance Near Field Radiative Transfer for Energy Harvesting Devices

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Radiative heat transfer between surfaces separated by sub-peak wavelength distances has shown to be substantially enhanced compared to those separated by larger scale gaps. This surface phenomenon caused by the coupling of evanescent (vanishing) waves with zero time-averaged net energy flux [1], is referred to as near field thermal radiation. When the gap between two surfaces is in perfect vacuum and the conduction and convection heat transfer become negligible [2], the near field radiation is shown to be of orders of magnitude greater than Planck's blackbody radiation. This enhancement has potential use especially for thermo-photovoltaic (TPV) applications, where the infrared (IR) thermal radiation incident on a hot (emitter) surface is transferred to a cold one (receiver) and converted directly into electricity via the photovoltaic effect [3]. The material choice stands as a critical parameter in nano-TPV devices. The surface waves created along the interface are either surface plasmon polaritons (SPP) or surface phonon polaritons (SPhP). In recent studies [4, 5], a hybrid mode called a surface phonon plasmon polariton is also reported. When the dispersion relation of the surface waves are considered, the right hand side of the light line corresponds to evanescent waves, while the left hand side corresponds to propagating waves [6]. In the mid-IR region, the SPP's are modified to be Zenneck waves with a dispersion relation coinciding with the light line, and generally the inaccessibility of the mid-IR region by SPP's has been solved by the utilization of SPhP's in that range [7]. The most commonly investigated materials that support SPhP's are polar materials, such as SiC, BN (both hexagonal and cubic), and BC [8] with which significant improvements in the heat flux has been obtained.

For a complete analysis of the system on near field thermal radiation characteristics and device behavior, the first step may be developing a solid understanding on the material types and system geometry, both of which critically affect the nano-TPV device fabrication procedures and working conditions. A detailed survey of previous investigations showed that for the construction and testing of a near field thermal radiation harvesting device; a number of parameters such as mechanically and thermally stable life-time, thermal management of the system [9], and sustaining of vacuum between the emitter and receiver surfaces must be ensured. In this study, the effect of the material choice (plasmonic, phononic, and their combination) on near field radiative heat transfer along with the harvesting device fabrication requirements has been discussed. The relevant literature is reviewed to outline the recent advances in the field such as the effect of the presence of artificially made materials with superior electrical and optical properties (metamaterials) in nano-TPV structures.

Keywords: thermophotovoltaics, surface plasmon polaritons, surface phonon polaritons, near field thermal radiation

Acknowledgements
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Modeling of Thermodynamic and Thermopysical Properties of Refrigerant Mixtures

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In order to analyses and model refrigeration systems as a thermodynamic or heat transfer system, a complete thermodynamic and thermophysical property sets should be available in computer environment. Thermophysical properties such as thermal conductivity, viscosity, surface tension, and thermodynamic properties of saturated, liquid and vapor phases are needed in a complete system analysis. Recently refrigerant mixtures, as well as pure refrigerants are widely used in refrigeration systems, therefore thermodynamic and thermophysical properties of these refrigerant mixtures are needed for system analysis. Thermodynamic and thermophysical properties of refrigerant mixtures are modelled as a set of programs in java language in order to simulate and analyse refrigeration systems.

Due to recent adaptations of new refrigerants and phase out of old refrigerants, data for all new set of refrigerations should be available for utilisation of researchers. International standard office (ISO) is started an afford to make a standard equation of states, and developed equations for some refrigerants as ISO 17584-2005 standard. This standards covers the basic equation of states for pure refrigerants R744, R717, R12, R32, R123, R125, R134a, R143a,R152a, as well as refrigerant mixtures R404A(%44 R125 - %52 R143a - %4 R134a), R407C(%23 R32 - %25R125 - %52R134a) ,R410A(%50 R32 - %50 R125) and R507A(%50 R125 - %50 R143a). The basic equation of states is in the form of helmholts free energy equations for pure gases and mixtures. Pure refrigeration's in this standard were previously modelled, in this study refrigeration mixture equation of states are modelled and computer codes are prepared. This standards as is, not covers all the possible refrigerants and the thermodynamic properties of remaining refrigerants can be found from several research papers. Data found for the remaining gases covers a variety of equation of states such as Benedict-Webb-Rubin, Martin-Hou, Peng-Robinson-Stryjek-Vera. R402A (%60 R125 - %38 R22 - %2 R290), R402B(%38 R125 - %60 R22 - %2 R290), R401A(%53R22 - %13 R152a - %34 R124), R401B(%61 R22 - %28R152a - %28 R124) gas mixtures are modelled by using Peng-Robinson-Stryjek-Vera equation of state.

In order to develop heat transfer models of refrigeration systems thermophysical properties such as viscosity, thermal conductivity and surface tension is also required. In order to get this data printed table data is curve fitted by using cubic spline method.

The remaining properties derive from Legendre transforms of these equations of states called Maxwell relations. In order to use any other set of independent variables requires root finding methods. Root finding from thermodynamic processes is a challenging process due to enormous differences in properties of liquid and gaseous state such as specific volume, Furthermore in gas mixtures saturation temperature is not constant, and this effect should be taken into the consideration. In order to overcome this difficulty a general form of equation of states with easier methods of root solving such as cubic equation of states for mixtures can be utilized as first estimation method. For the saturation (phase change) region of the equation of state and for thermophysical properties, it is found out that using cubic spiline and B-spline interpolation methods supply minimum errors in data.

By combining all these methods, numerical models of thermophysical and thermodynamic models of refrigerant mixtures are developed. Programs are freely available for all scientists require using such analysis. Program codes are available from address www.turhancoban.com

Keywords: Refrigerant Mixtures, Equation of States, Thermodynamic Properties, Thermophysical Properties

Effect of B Element Ratio on Thermal Properties of $Nimn_{40}co_5sb_{10-X}b_x$ Alloys

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We have studied thermal properties of polycrystalline $NiMn_{40}Co_5Sb_{10-x}B_x$ alloys (atomic percentage) for x= 0, 1, 2, 3, 4, 5. Polycrystalline $NiMn_{40}Co_5Sb_{10-x}B_x$ alloys were prepared by arc melting method by using metals powder with high purity in pure argon atmosphere. The alloys in the form of ingots were melted several times to ensure homogenization and then they were annealed at 800 ^oC for 20 hours. Microstructural characterization of the samples was investigated by using scanning electron microscope and X-ray diffractometer. Atomic concentration of the alloys was determined by energy dispersive X-ray spectroscopy (EDX). The atomic percent of $Ni_{45}Mn_{40}Co_5Sb_{10}$ alloy was found as $Ni_{45,16}Mn_{38,12}Co_{6,53}Sb_{10,20.}$

Transformation temperatures of alloys were determined by differential scanning calorimetry with 5, 10, 15, 20 and 25 ^oC/min heating-cooling rates in nitrogen atmosphere. Martensite and austenite transition temperatures were defined as $T_M=(M_s+M_f)/2$ and $T_A= (A_s+A_f)/2$, respectively. Activation energies of austenite transition for $NiMn_{40}Co_5Sb_{10}$, $NiMn_{40}Co_5Sb_9B_1$, $NiMn_{40}Co_5Sb_8B_2$, $NiMn_{40}Co_5Sb_7B_3$, $NiMn_{40}Co_5Sb_6B_4$ and $NiMn_{40}Co_5Sb_5B_5$ alloys were found as 185 kJ/mol, 297 kJ/mol 370 kJ/mol, 372 kJ/mol, 569 kJ/mol, 722 kJ/mol by means of the Kissinger equation, respectively. The martensite-austenite transition temperatures (T_A) and activation energies (E_a) of the alloys increased with increasing ratio of boron and decreasing ratio of antimony.

Keywords: Martensit-austenite transition temperature, activation energy, boron, NiMnCoSbB

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Viscoelastic and Mechanical Properties of Olive Pomace Filled Polypropylene (PP) Composites

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Agricultural wastes are considered as organic and cheap materials. The management of agricultural wastes is very important for sustainable environment. In this study, olive pomace residues were supplied from Manisa region in Turkey. The residues were grounded by using a mechanical grinder and sieved to particle size<50 μm.In order to prepare PP based composites, olive pomace fillers in the range of 10 to 40 wt% were mixed with PP via high speed kinetic mixer. Viscoelastic properties (Storage modulus, loss modulus and tanδ values) were obtained by using dynamic mechanical analyser. Tensile strength, Young's modulus, elongation at break values was determined via universal testing machine. It was observed that Young's modulus and storage modulus were increased with increasing olive pomace content. With the addition of 40 wt% olive pomace into PP, Young's modulus of PP increased by 75%. Besides the effect of olive pomace loading into PP on thermal conductivity of PP was investigated in this study.

Keywords: Viscoelastic, Olive Pomace, Polypropylene (PP), Composite, High Speed Kinetic Mixer

Preparatıon and Mechanıcal Propertıes of Graphene Oxıde (GO)/ Polyvınyl Chlorıde (PVC) Composıtes

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Graphene oxide (GO)/ Polyvinyl Chloride (PVC) composites were prepared by colloidal blending. The microstructure features and mechanical properties of the composites were investigated by Scanning Electron Microscope (SEM), universal testing machine and Knoop microhardness, respectively. As shown in the SEM images, GO sheets were well dispersed within the PVC matrix resulting in a micro porous morphology. The addition of GO sheets up to 1.0 wt.% not only increased the tensile strength of the pure PVC gradually, but also improved its knoop microhardness slightly. The adding of GO did not affect the composite' elongation at break (%).

Keywords: GO/PVC Composites, Colloidal Blending, Mechanical Properties

Optimization of Weld Parameters of Hot Plate Welded ABS+PC Blends by Using the Taguchi Experimental Design Method

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The aim of this study is to investigate the effect of welding parameters in hot plate welding process of ABS+PC blends. Three welding parameters, namely the plate temperature, heating time and weld displacement were optimized in terms of weld strength by using the results of tensile tests and flexural tests. To set the optimum welding parameters and determine the optimal levels, Taguchi experimental design method was implemented. For the three process parameters each with three levels, L9 orthogonal array was utilized. To indicate the effects of welding parameters on joint strength, signal to noise and the analysis of variance techniques were employed.

Keywords: Hot Plate Welding, Material Characterization, Taguchi Method, Parameter Optimization

Thermal Conductivity of Polymeric Materials – Accuracy of Different Measurement Techniques

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The thermal conductivity (TC) is a highly important material characteristic for numerous applications. To determine the TC several measurement systems are available today. These techniques employ either stationary or transient procedures and can be employed for a wide range of materials. However, measuring the TC of polymeric materials (especially of polymeric compounds) is still rather complex and it is not fully agreed upon which method generates the most accurate data. Hence, the overall objective of the present study is to systematically compare accuracy and cost-efficiency of different TC measurement methods in terms of analyzing polymeric materials. The following devices were employed: TPS 2500S (Hot Disk AB, Gothenburg, SE), LFA 427 and DSC 204 F1 (NETZSCH, Selb, DE), DSC 1 (Mettler Toledo, Greifensee, CH) via ADSC after Marcus and Blaine's method published in 1994[1], Transient Hot Bridge (LINSEIS, Selb, DE) and DTC 300 (TA Instruments, New Castle, Delaware, US). In order to study the effect of material structure on TC, polymer superstructure and morphology was varied systematically. Amorphous (PMMA) as well as semi-crystalline polymers (LLDPE with a crystallinity of 37% and HDPE with a crystallinity of 70 %) were investigated. Each polymer type was additionally compounded with copper in order to increase TC. Copper geometry (spheres, flakes and irregular particles) as well as copper concentration (10 wt. %, 30 wt. % and 50 wt. %) were varied systematically, resulting in 30 different materials (3 raw polymers and 27 compounds). Morphology was analyzed applying Scanning Electron Microscopy and Differential Scanning Calorimetry. TC measurements as well as morphological investigations were performed on specimens taken from plate-like samples, which were produced via sheet-molding.

Different measurement systems yielded slightly different TC values for the very same material. A sound scientific and statistical data evaluation was done. Analysis of accuracy and cost-efficiency slightly favors transient to stationary measurement procedures. A distinct correlation between crystalline morphology and TC was established: higher polymer crystallinity yielded higher TC. The

effect of copper on TC was rather low, which can be ascribed to the low volume concentrations investigated. However, the effect of copper on TC was significantly affected by the particle geometry. Copper flakes yielded highest TC values (up to 5 times higher TC than raw material).

Keywords: Thermal Conductivity, Polymer Compounds, Copper Particles, HDPE, LLDPE, PMMA

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Thermal Performance of a Multi-Holed Brick Considering Different Hole Shapes and Hole Arrangements

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In this work, heat transfer characteristics of multi-holed bricks are investigated numerically. A conjugate heat transfer excluding and including surface-to-surface radiative heat transfer is studied. Computations are performed for three different shapes of air-filled cavity holes: square, circle and rhombus. Besides, the number of holes of a given fixed size brick is varied in the parallel and vertical directions of heat flow to determine the most effective configuration of the holes. Computational results show that although the thermal resistance of the bricks improves with the increase in number of holes thus void fraction of air, the highest improvement is achieved for the square-shaped cavities followed by circular-shaped and rhombus-shaped cavities, respectively. It is found that for the same hole shape and the same void fraction of air, increasing the number of holes in the perpendicular direction of heat flow rather than in the parallel direction to heat flow is more effective in terms of thermal insulation.

Keywords: Multi-Holed Brick, Energy Saving, Thermal Optimization, Thermal Performance

Parametric Transient Analysis of Thermal Insulating Plaster for Exterior Wall

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To achieve heat control between indoor and outdoor environments, design and thermal behavior of the exterior facades of building is significantly important for energy efficient consideration. Application of heat insulation to the facades of the building is most remarkable solution of the entire set of policies related to regulations on global scale. To provide the effective use of thermal insulation systems should be set as one of the most critical objectives of sustainable buildings. Achieving high levels of insulating materials to building external walls are getting thinner and also increasing the building usage area. Thermal insulating plaster can be one of the possible solutions for energy restriction of the building facades. New kinds of thermal insulating plaster application is flexible to construct and can be suitable for any architectural solution. This research aims to understand time-dependent thermal behaviors of the exterior façade using autoclaved aerated concrete as a thermal insulating plaster. For that purpose, thermophysical properties of the plaster are measured and used in a software code for

parametric analyses by using different plaster thicknesses under climatic conditions of Izmir located in hot-humid climate zone in Turkey.

Keywords: Thermal Insulation, Insulation Thickness, Thermal Insulating Plaster

Experimental Investigation on Bolted Natural Fibre Reinforced Composites

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Aim of the study is an investigation on the failure behaviour of bolted joints which are natural fibre reinforced polymeric composites under tensile loading condition. For this aim composite plates were designed as eight layers orientation angels of biaxial jute fabric $(0/90^0)_8$ and epoxy resin. The jute fabrics were pH 7 treated before composite production. Alkali treatment was applied by 1% NaOH solution during two hours and litmus papers were used to adjust the pH value of fabrics. Vacuum assisted resin infusion method (VARIM) was used for composite production. After epoxy resin impregnation, at 80 ^{0}C during 8h curing process was applied. Fibre volume fraction of composites obtained approximately 38%. Then the composite plates were cut by circular saw and the holes were drilled according to ASTM D5961M-13 standards dimensions. Five specimens were tested under tensile loading and results were given by graphs. Failure mode were occurred the same in all specimens as net-tension mode.

Keywords: Bolted Composite, Natural Fibre, Vacuum Assisted Resin Infusion Method (VARIM).

Effect of Divided Core on the Shear Performances of Textile Reinforced Foam Core Sandwich Composites

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Sandwich composites are manufactured by using facesheets and core material in-between the facesheets. Facesheets are expected to be rigid and stronger; textile reinforcements are popularly preferred. Core materials are expected to be lighter but thicker and with lower strength than the facesheets; foam cores are popularly preferred. Sandwich composites are generally used in marine applications, wind turbines, space and aircraft vehicles due to their high bending rigidities in addition to their lighter weights. The properties of the facesheet, stiffness and strength properties of the core and the strength of core-to-facesheet bonding determine the characteristics of the sandwich composites. Thus in this study it is aimed to propose an enhancement for the shear performances of sandwich composites with the comparison of regular and improved sandwich composites with divided cores.

The sandwich composites were manufactured with epoxy resin by vacuum infusion method using unidirectional glass fabrics as the sheet material and PVC foam as the core. Sandwich composites were manufactured with four types of foam cores: reference specimen with plain single core, perforated specimen with perforated single foam core and specimens with divided core for both the reference and perforated specimen with the aim to examine the effect of dividing the core; for the divided core specimens an interlayer sheet of unidirectional glass fabric is places between the cores while keeping the number of sheet layers equal to each other for all types of specimens. For the

perforated cores; the hole diameter and density were the same for all of the specimens and holes were drilled prior to composite manufacturing so that during the infusion process, these holes were filled with epoxy. Shear tests were performed according ASTM C273/273M standard and the results were compared.

From experimental results it is concluded that in terms of shear strain, perforation has decreased the strain and dividing the core decreases less. Perforating and dividing the core increases the modulus and shear strength. For plain core specimens; dividing the core shall be preferred instead of using a perforated core as the shear strength is enhanced similarly while for the divided plain core specimen the strain is higher besides being less laborious as it is possible to purchase core material with any thickness.

Keywords: Sandwich Composite, Shear, Glass Fiber, Epoxy, PVC Foam

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Impact Response of Perforated Foam Core Sandwich Composites: Effect of Core Thickness

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Sandwich composites are made of core and facesheet layers. The facesheets are thin and stronger while the core is lighter, relatively thicker and have lower strength. Sandwich composites' rigidity depends on the core material thickness. Rigidity increases with increasing core thickness. In this study it is aimed to analyze the effect of thickness on the impact response of sandwich composites.

Sandwich composites were manufactured using PVC foam core. Three core thickness vales as 10, 15 and 20 mm were selected and the cores have been perforated prior to composite manufacture. In the facesheets multi directionally oriented glass fiber mats were used. Vacuum infusion method was selected as production method. The hole diameter and the density were the same for all of the specimens as 2.5 mm and 0.5 hole/cm^2 respectively. During the infusion process, these holes were filled with epoxy and behave like columns of the structures. As the reference, sandwich composites with un-perforated core of 20 mm thickness have also been manufactured.

Impact tests were performed by using Fractovis Plus drop weight impact test machine. The impactor has a 12.7 mm diameter hemispherical nose, which is connected to a force transducer having the maximum loading capacity of 22.4 kN. The total impactor mass was 4.926 kg. All the experiments were conducted in the room temperature.

From experimental results it is concluded that epoxy columns, due to the holes in the cores, increase the impact performance and the core thickness affects the response of the sandwich composite against impact loading.

Keywords: Sandwich Composite, Impact, Glass Fiber, Epoxy, PVC Foam

Acknowledgement

The authors are greatly indebted to the TUBITAK Research Foundation for providing financial support (Project Number: 213M603).

The Change of Thermal and Microstructure Properties of Cu-Based HTSMAs

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In this study, the changes of transformation temperature of High Temperature Shape Memory Alloys named as CuAlCr and CuAlCrNi that have drawn attention recently due to their technological applications were investigated. These alloys were produced by melting method in an arc-melter furnace. The phase transformation and microstructure properties of produced high-temperature shape-memory alloys were studied by means of DSC, XRD, optical microscopy and Vickers micro hardness measurements system.At the end of DSC measurements it was observed that CuAlCr alloy have A_s =302.1, A_f=399.4, M_s=243.7, A_f=187.9^{o}C and CuAlCrNi alloyhave A_s =256.3, A_f=299.1, M_s=209.5, A_f=148.2^{o}C.These results are shown that Ni addition on CuAlCr shape memory alloy are decreased the transformation temperature of alloy. Also, according to DSC measurements, enthalpy change of CuAlCr and CuAlCrNi alloys for martensitic transition are 3.35mj/mg and 2.80mj/mg, respectively.

Keywords: Shape Memory Alloy, Transformation Temperature, Microstructure

Thermal Procedure Effects of CuAlNiTi Shape Memory Alloys

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Thermal procedure onto shape memory alloys is important for transformation temperature and crystal structure. The aim of this study is to investigate that different quenching condition effects after thermal treatment of CuAlNiTi shape memory alloy. The quenching conditions are ice brined water, liquid nitrogen and cold alcohol respectively. The highest martensitic transformation temperature was seen ice brined water and cold alcohol and austenite start transformation of CuAlNiTi alloy about 295 ^{o}C. When the alloy's crystal structure examined after quenching, martensite and precipitates phases were seen. According to EDS analysis of alloy, precipitate of alloys can be named as X phase.

Keywords: Quenching, Transformation Temperature, X Phase, Precipitate

Ageing Temperature and Ageing Time Effects on Thermal Properties of CuAlCr Shape Memory Alloy

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High temperature shape memory alloy certainly used for aerospace engineering and other high temperature applications. In this application NiTi shape memory alloys used especially. But element of NiTi alloys is very expensive, furthermore this alloy is not comfortable. Recent last years, Cu based shape memory alloy used instead of NiTi alloys. Because Cu based alloys are cheaper. Aim of this study, to improve thermal properties of CuAlCr high temperature shape memory alloy. In accordance

with this purpose, we applied ageing CuAlCr alloy for different times and different temperature. Chosen ageing temperatures are 500 and 700 ^{o}C and times range are between one and four. Transformation temperature of CuAlCr alloy for 500 ^{o}C ageing temperature is not seen. It can be concluded that this ageing temperature inappropriate. For 700 ^{o}C ageing temperature, alloys show transformation temperature and transformation temperature was decreased by increasing ageing time. Transformation peak temperatures were decreased between 350 ^{o}C and 431 ^{o}C temperature range. The X ray analysis of CuAlCr alloys were done. The crystal structure of alloys did not change but, intensity of peak increased by rising ageing time.

Keywords: Ageing Temperature, Activation Energies, High Temperature Shape Memory Alloy

Acknowledgement

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Calorimetric and Densimetric Measurements for Modelling Elimination of Carbon Dioxide by Dissolution in Aqueous Systems: Data for Geological Sequestration

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Geological storage of carbon dioxide (CO2) in deep saline aquifers is proposed as an option to reduce greenhouse gas emissions from fixed sources. In the case of sequestration of CO2, captured from industrial effluents, the gas contains impurities (Annex gases) such as sulfur dioxide (SO2), nitric oxide (NO) or oxygen (O2). It is crucial to understand the role of these gases on the geological behavior of the aquifers to ensure safety of the storage. This can be achieved by conducting geochemical and thermodynamic simulations to model the long-term behavior of the co-injected gases within CO2 storage sites. Furthermore, to validate and improve thermodynamic models representative of the vapor-liquid-equilibria of these systems it is required essential experimental data. A customized flow mixing unit was adapted to a SETARAM C-80 Calvet-type calorimeter [1-2] and used in the measurement of the enthalpies of solution and the solubility of CO2 and co-injected gases in aqueous salt solutions, representative of the saline aquifers. Enthalpies of solution of CO2 (ΔsolH) are obtained as function of loading charge α (moles CO2 / mole solvent) at constant temperature, between 323K and 373K and at pressures up to 15 MPa.

Apparent molar volumes of CO2 in aqueous solutions were obtained using a flow vibrating-tube densitometer from Anton Paar [3] equipped with a pre-mixing cell designed in the laboratory. Measurements were performed at temperatures up to 473 K and pressures up to 10 MPa. Apparent molar volumes were determined at different molar fractions of CO2 and extrapolated to infinite dilution.

The consistency of the obtained results (enthalpies of solution, solubilities and densities) and the comparison with literature and predicted data will be discussed.

This work is part of general project (SIGARRR) conducted under financial support of the French National Agency for Research (ANR).

Keywords: Carbon Dioxyde, Solubility, Flow Calorimetry, Electrolyte Solutions, Enthalpy of Solution, Apparent Molar Volumes

Effect of Polymer Concentration on the Release Characteristics of Thyme Oil Microcapsules

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Essential oils have been used as food preservatives due to their antioxidant, antimicrobial and anti-insect properties. However, one of the limitations of using essential oils as active agents is their volatility. In this research thyme oil containing gelatin/acacia gum microcapsules were prepared by complex coacervation and the effects of variations in gelatin/acacia gum concentrations of thyme oil loaded microcapsules were examined. Effect of variations in gelatin/acacia gum ratio, on the oil load (%), oil content (%), encapsulation efficiency (%) and release rate of thyme oil from microcapsules were determined. The thyme oil-loaded microcapsules were smooth and spherical in shape as revealed by scanning electron micrograph. Results of Fourier transform infrared spectroscopy indicated stable character and showed the absence of chemical interaction between the thyme oil and gelatin/acacia gum blends.

Keywords: Gelatin, Acacia Gum, Complex Coacervation, Microencapsulation, Release Rate

Synthesis and Characterization of $Zn_{0.98}Al_{0.02}O$ Powders by Sol-Gel Method

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In this paper, synthesis and characterization of $Zn_{0.98}Al_{0.02}O$ powders were systematically investigated by sol-gel method for high temperature thermoelectric generator applications. Solution characteristics were examined by Turbidity and pH measurements using turbidimeter and pH meter. Thermal properties of the powders were characterized by Differential Thermal Analysis-Thermogravimetry (DTA-TG) to obtain appropriate calcination regime. Structural properties of the powders were fulfilled by X-ray Diffraction (XRD). X-ray Photoelectron Spectroscopy (XPS) was used to specify chemical composition and empirical formula of the elements existed within the powders. According to the DTA-TG results, process optimization was performed by clarifying temperatures of drying, oxidation and phase transformation processes. DTA curve exhibited that endothermic and exothermic reactions take place between temperatures of 200 °C and 345 °C. XRD study confirmed that the powders consist of $Zn_{0.98}Al_{0.02}O$ phase. It can be seen from the phase spectrum that 2θ peaks are matching with typical ZnO peaks (periclase, JCPDS: 01-089-0510) and compatible with the literature.

Keywords: Sol-Gel Processes, Photoelectron Spectroscopies, Thermal Analysis, X-Ray Diffraction

Obtaining High Quality Wafer Surface for Micro Texturization of Solar Cell Applications

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Silicon is the essential material in solar cell application and the production of solar cell has many exhausting steps such as CZ process, diamond wire saw, lapping, polishing, dicing, texturing, formation of p-n junctions, metallization. Texturization step has a critical factor on the reflectance performance of the silicon solar cell efficiency. However, diamond wire saw, lapping and polishing steps are consuming too much time, material and requiring high technological equipment before the texturing process. Therefore, preparation cost of wafers for the texture step is increasing extremely. In this study we have determined the cutting parameters in order to obtain smoother surface after the diamond wire saw. Furthermore, instead of chemical mechanical lapping and polishing process, we applied a chemical polishing process in order to decrease the duration and consumed material. Chemically polished wafers are exposed to micro etching. Reflectance and SEM measurements are employed in the study and reflectance results are satisfactory and micro pyramids are obtained uniformly.

Keywords: Solar Cell, Silicon Wafer, Lapping, Polishing, Slicing, Chemical Polishing, Texturing

Thermal Performance of Ag-Water Nanofluids in a Single Phase Natural Circulation Mini Loop

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Nanofluids, considered to be potential heat transfer fluids for the next generation, have been studied for more than two decades. Their enhanced thermophysical properties and heat transfer performance would make them very attractive for thermal systems. In this study, the thermal performance of a natural circulation mini loop working with Ag-water nanofluid was investigated by using effectiveness factor. The results were compared with the previous results of Al_2O_3-water nanofluids which have been studied in the same system. It is observed that the effectiveness of system enhanced with the increase of particle concentration and inclination angle. Using silver particles, even with lower concentrations, improves the system effectiveness more than Al_2O_3.

Keywords: Natural Convection, Nanofluid, Effectiveness

Effect of Loop Aspect Ratio on the Performance of Nanofluid Based Single Phase Natural Circulation Mini Loops

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Single phase natural circulation mini loops (SPNCmL) are good candidates for nanofluid applications because of unneeded pump usage. The buoyancy driven flow in the loop has been studied for Al2O3-Distilled water (DIW) nanofluids both experimentally and numerically to investigate the loop performance [1, 2]. It was seen that loop performance increases with the increased Al2O3 content in the nanofluid. Additionally, the inclination angle of the loop has a positive effect on the loop performance.

Geometry is also an important factor for heat transfer performance of the loop. Aspect Ratio (AR) of the loop (height/width) is a fundamental parameter which effect loop performance. In the previous studies a loop which has an AR of 1.38 was used. Due to the experimental difficulties, numerical simulation results are conducted in this study. The numerical model was validated in a previous study [1], with the experimental data by comparing the numerical and experimental results for different working conditions and working fluids. The same numerical modelling approach is used in this study, and SPNCmLs with AR values 1.2, 1, 0.8, 0.6, and 0.4 was investigated for different working fluids (DIW). The width of the loop as well as the length of the heater and cooler sections are kept constant and only the height of the loop was changed to obtain different AR values.

Loop characteristics (mass flow rate, ΔTheater and Tmax) and performance (effectiveness) is reported. Results of this study shows that; decreasing AR (shortening the loop) increases ΔTheater and Tmax values, as the total mass is also decreased by shortening the loop while keeping the heater power in the same range for all working fluids (DIW and Al2O3-DIW nanofluids with different weight percentages) . Mass flow rate decreases and the effectiveness of the loop increases as the AR decreases. As an indicator of the loop performance, the increases in the effectiveness with decreasing loop height is an encouraging result for miniaturized SPNCL's as an application area for nanofluids. However, increasing Tmax is a risk for phase change in the loop and should be studied carefully.

Keywords: SPNCml, Nanofluid, Natural Convection

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An Influence of the Nanoparticles Al_2O_3 Additives in Isopropyl Alcohol and Propylene Glycol on Heat Capacity in the Liquid and Solid Phases

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New experimental data for the heat capacity on the saturation line for the pure isopropyl alcohol and nanofluids (solutions of the isopropyl alcohol and nanoparticles Al_2O_3) have been reported in the paper. We also present the description of the experimental setup that realizes method of direct heating

in adiabatic calorimeter. The calorimeter has been used for experimental investigation of the heat capacity for pure isopropyl alcohol as well as for nanofluids (solutions of the isopropyl alcohol and nanoparticles Al_2O_3) in temperature range from 80 to 330 *K* at weight fractions of nanoparticles 2.008%, 5.107%, 9.958%. Procedure of fitting of the obtained experimental data is reported. Analysis shows that mean uncertainty of the measured heat capacity does not exceed 0.408% Obtained results indicate that admixtures of nanoparticles Al_2O_3 lead to decreasing the heat capacity of the liquid and solid phase of isopropyl alcohol. In addition, the heat capacity in the glassy and metastable states is measured. For the first time information about structural changes for the studied solutions in the solid phase is presented.

Based on obtained experimental data we proposed new "3-phase" prediction model for the heat capacity of the nanofluids. Proposed model considering an excess mole heat capacity. This value can be determined as heat capacity of the surface layer which is formed on the surface of the nanoparticle due to sorption. The surface layer can be assumed as molecules of the base liquid. We would emphasize that value of excess heat capacity of the nanofluids correlated with changing of hydrodynamic radius of the nanoparticles.

Keywords: Heat Capacity, Nanofluids, Nanoparticles Al_2O_3, Isopropyl Alcohol, Experiment, Prediction Model

Enhancing the Thermal Conductivity of Oils by Using MWCNTS as Additive

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Following the great need for innovation in the field of lubrication and lubricants, different materials with various nanostructures are employed as additives in order to improve the thermal properties of lubricants. Enhancing the thermal conductivity of the lubrication oils will lead to considerable extension in engine life, increment in load/cooling capacity and thus decreasing in energy consumption, and in general increment in the efficiency [1]. Among various nanoparticles, our works focus mainly on the suspensions of carbon nanotube (CNT) due to the enormously high thermal conductivity of CNT (3000 W/m.K for multi-walled CNTs [2]) and hence the great potential for heat transfer enhancement compared to the pure oil. Although of the notable number of researches in the nanofluids field, which are mostly focusing on the preparation and evaluation of water or ethylene glycol based nanofluids, only very few studies reported the CNTs-oil-based nanofluids [3]. This study presents a simple effective way of producing MWCNT/mineral oil nano-lubricants and discusses the parameters affect the production procedure. Also ,we measured the thermal conductivity of nanofluids by 3ω method and investigated how adding CNTs affects the viscosity of the nano-lubricants.

Keywords: MWCNTs, Nano-Lubricants, Nanofluids

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Numerical Study on Nanofluid Based Flat Plate Solar Collector

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Flat plate solar thermal collector technology is widely used in residential applications, industrial and commercial buildings due to their easy and low cost installation and maintenance. In milder climates the utilization of flat plate solar thermal collectors are preferred to respond hot water requirement. Generally, in such systems water is used as a working fluid. Nanofluids are new generation heat transfer fluids which consist of a base fluid and nano-sized particles. Since, they have high thermal conductivity compared to conventional heat transfer fluids, they have many potential thermal applications. This numerical study aims to investigate the thermal performance of a flat plate solar collector working with nanofluid. For the analysis two-dimensional and transient mathematical model developed in MATLAB. Analysis have been performed first with water and then repeated for the case of using nanofluid. The thermal performance results of water and nanofluid were compared.

Keywords: Flat Plate Solar Collector, Nanofluid, Numerical

Phase Equilibria in Fluid Mixtures Embedded with Graphene Genealogic Tree Nanoparticles

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Knowledge phase behavior is of immense interest to decode the puzzle phenomena associated with novel and emergent nanotechnologies. The principal aim of this work is to study the phase behavior of fluid mixtures doped with graphene genealogic tree nanoparticles (carbon nanotubes, fullerenes, graphene flakes). At first stage, we analyze the influence of nanoparticle adding on critical point shift in the one-component fluids. Here we consider as an example the critical point shift for CO2 embedded with different types of nanoparticles: graphene genealogic tree (CNT, fullerenes, and graphene flakes). We suggest that regular and singular parts of thermodynamic surface of reference fluid and nanofluid are coincided in the reduced form. The growth of volume nanoparticle concentration tends to increase slightly the CO2 nanofluid critical temperature. Changes that are more significant observed for critical density. The shift of critical point for liquids of industrial interest is also theoretically predicted.

Global phase diagrams of binary mixtures with nanoparticles are analyzed. The global phase diagram studies provide some basic ideas of how the required methods should be developed to visualize the phase equilibria in the nanofluid blends. The mapping of the global equilibrium surface in the parameter space of the equation of state model provides the most comprehensive system of criteria for predicting binary mixture phase behavior. Nanoparticle adding has different influence on the global phase diagram. Critical temperature variation of nanofluids is not significant to change the phase behavior types on global phase diagram. Hence, the cohesive energy density for reference fluid and nanofluid are approximately the same.

Influence of nanoparticles on the shift of liquid – liquid equilibria we have studied for the liquid – liquid coexistence curve of the binary fluids nitrobenzene-heptane and nitrobenzene – heptane –

graphene genealogic tree nanoparticles. We have shown that the presence of nanoparticles in a binary critical mixture of two liquids changes the location of upper critical end point.
This study is one of the first attempts to establish and demonstrate the relationships among the phase equilibria phenomena in liquids doped by nanoparticles. From the very beginning of these efforts, the global phase diagrams have been a very useful tool for scientists and engineers working in the field of emerging nanotechnologies. Extension of our knowledge about global phase behavior of two- and multicomponent fluids will lead to the creation of reliable engineering recipes for solving the actual problems nanotechnology applications.

Keywords: Nanofluid, Heat Transfer, Pressure, Constructal Media, Thermodynamic Properties

The Measurements of Thermophyscial Properties of High Density Polyethylene/Graphene Nanoplatelets Nanocomposites by Planar Disk Transient Method

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Thermally conductive polymer nanocomposites have increasing interest due to their potential advantages in many application areas such as electronic devices, photovoltaic cells, electromagnetic interference shielding devices, super capacitors, low-power rechargeable batteries and light-emitting diodes [1]. Among thermally conductive filler materials, the graphene nanoplatelet (GNP) has been used commonly in the recent years because of the excellent thermal conductivity, mechanical properties and electrical properties. The defect free single layer graphene has thermal conductivity of ~4840-5300 W/mK, electrical conductivity of 6×10^5 S m^{-1}, excellent gas impermeability and the Young's modulus value of ~1.0 TPa [2, 3]. The high density polyethylene (HDPE) is the most widely used thermoplastic polymer in polymer nanocomposites application, because of its properties including good processability and chemical resistance, nontoxicity, ease of recycling, biocompatibility and low cost [4]. In the literature, there are many studies on electrical and mechanical properties of HDPE/GNP nanocomposites, but the studies on thermophysical properties are not documented frequently. There are many ways to measure thermophysical properties of materials described in the literature. The Pulse Transient (PT) method is one of the dynamic methods for the measurement of thermophysical properties of materials. PT method has the simple specimen set-up containing of three pieces. The heat source and the thermocouple are inserted in between them. The thermal diffusivity, thermal conductivity and specific heat of the samples are determined from the single measurement of the temperature response on the heat pulse using corresponding model. The models were derived for the cylindrical and cuboid geometry and both of them include also the heat losses effect from the sample surface if necessary [5, 6].

In this study, the effect of GNP concentration on the thermophysical properties of HDPE nanocomposites was investigated. HDPE/GNP nanocomposites were fabricated by melt mixing method up to volume fraction (vol.) of 10 % of GNP content, followed by compression molding. The thermophysical properties of samples were determined by PT method. The results show that the thermal conductivity and thermal diffusivity of HDPE/GNP nanocomposites increase with increasing the content of GNP. An increase of 76.3 % in thermal conductivity and 86.3 % in thermal diffusivity of the HDPE/GNP nanocomposites with 10 vol % of GNP content was observed.

Keywords: Polymer Composites, Thermophysical properties, Planar Disk Transient Method

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Grain Size Effect on Fatigue Life of WC-Co 40 Mainly Used in Cold Forging Tools

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Life cycle of forging dies used in cold forging industry has always been a limitation in tool design process. Changes in binder ratio of the material and grain size, directly affects the mechanical behaviour of forging dies. Thus makes wide range possibilities and service behaviors of forging tools. Aim of the studies was to determine fatigue behavior of WC-Co 40 for making life prediction of forging tools. Three point bending fatigue test were carried out at constant stress ratio on a fine and coarse grained WC-Co which were used in cold forging industry. Mainly two different aspects which were the grain size effect on lifecycle and surface roughness on fatigue life were investigated and comparative results obtained from experimental tests was given in the study.

Keywords: WC-Co, Fatigue Life, Grain Size, Cold Forging Dies

Effect of TiO_2 and Cr_2O_3 on Properties of CaO-Na_2O-SiO_2 Glasses

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The aim of this work is to study the effect of TiO_2 and Cr_2O_3 in low additions on the optical, color and thermo mechanical properties of soda-lime-silica glasses. Several compositions were developed and characterized. The results show a decrease of thermal expansion coefficients and an increase of glass transition temperatures with increasing both oxides content TiO_2 and Cr_2O_3 in glasses. However, an increase in flexural strength and Young's modulus were recorded with increasing TiO_2 and Cr_2O_3 content in glasses. Optical properties determined by UV-Visible spectroscopy reveal that the glass absorptions decrease with increasing TiO_2 content. In another hand, three new absorption bands around 350, 445 and 650 nm characteristic of Cr^{3+} and Cr^{6+} ions were also appeared in Cr_2O_3 doped glasses spectra. CIE L* a* b* parameters showed that TiO_2 doped glasses were colorless and a slight

improved clarity with the TiO_2 additions was detected. Electron paramagnetic resonance spectroscopy showed that the amount of ferric ions change with the addition of TiO_2 and Cr_2O_3. Fe^{3+}clusters formation and Cr^{3+} ions were also revealed.

Keywords: Soda-lime-silica Glasses, TiO_2, Cr_2O_3, Thermal Expansion, Mechanical Properties

Performance Analyses of Environmentally Friendly Low-GWP Refrigerants

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Refrigeration systems transferring heat from a low-temperature space to a region having high-temperature are of great importance to us in our daily life. The period starting from Montreal Protocol in 1987 and Kyoto Protocol in 1997 to the European Directive 2006/40/EC in 2006 [1] and EU Regulation No 517/2014 in 2014 [2] show the environmental aspects of the refrigerant selection in addition to the performance criterion. Montreal protocol aimed to phase out the chlorofluorocarbon (CFC) refrigerants due to their ozone depletion potential (ODP) while Kyoto Protocol focused on reducing the emission of the greenhouse gases thereby pointing out the low global warming potential (GWP) working fluids in the refrigeration applications. Nowadays, deadlines with regard to the stringent limits on the GWP values by EU legislation result in the high demand of environmentally friendly refrigerants fulfilling the requirements of the regulations. Therefore originating from the advances induced by the pressure of the EU normative, the subject of this paper is zero ODP and low-GWP new generation refrigerants. The main objective is comparing the performance of them and selecting the most promising candidates considering also their ASHRAE safety class [3]. This study combines some of the pure refrigerant groups from the literature, i.e., (i) hydrofluorocarbons (HFCs), (ii) natural refrigerants, (iii) hydrofluoroolefins (HFOs), and (iv) fluorinated ethers and alcohols and makes a performance comparison for refrigeration and air-conditioning operation conditions. Although some of those working fluids are investigated in detail in the previous literature studies, there aren't any analyses that they are gathered together to be evaluated on a comparative basis regarding different operation conditions. Moreover, this study would be beneficial for the researchers and manufacturers involved in this sector to clarify the preliminary performance questions about the comparison of these new generation refrigerants. The thermodynamic model of the vapor compression refrigeration cycle is constructed in Matlab® and the state properties of the refrigerants are obtained via REFPROP version 9.1 [4]. When considering the environmental issues, high performance, and safety criteria, R1233zd(E) and R152a is superior to the others.

Key Words: Refrigeration, Air-conditioning, COP, Environmentally Friendly Refrigerants, EU Regulation No 517/2014, The European Directive 2006/40/EC

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Oxidation Behavior of 316L Stainless Steel at High Temperatures in Air

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High temperature oxidation of nuclear reactor candidate material molybdenum-based 316L stainless steel was studied in air atmosphere. The tests were performed isothermally at temperatures of 773 K for 24 h in controlled air environment. Results showed that the steel was oxidized approximately following a parabolic law with a parabolic rate constant kp of 2.096x10-11 g^2m^{-4} sec^{-1}. A thin external oxide layer was observed, relatively irregular and inwardly protruded oxide layer was observed. As revealed by SEM/EDS and XRD results, oxide scale was formed, consisting of a thin outer layer of Cr, Fe, and Si. The layer had extensive SiO, and the inner layer had a significant Cr, Ni, and Fe layer which correlated well with the XRD results for Cr 0.19 Fe 07 Ni 0.11. A Thermogravimetric Analyzer, Scanning Electron Microscopy/Energy Dispersive X-ray Spectroscopy, and X-Ray Diffraction and X-ray photoelectron spectroscopy were among the analytical techniques used.

Keywords: 316L Stainless Steel, Oxidation, Metal Corrosion

Oxidation Behavior of Structural Material Incoloy 800H alloy for High Temperature Reactor Systems

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High Temperature Nuclear Reactor will require alloys to perform at temperature greater than those existing in current nuclear power plants. Candidate materials such as nickel-iron-chromium based high temperature alloys Incoloy 800H were exposed to air atmospheres and their corrosion was studied by a variety of analytical techniques. Tests were performed at 1473 K for 24 hours in Air for 400 grit Incoloy 800H alloy. Results showed that the alloy was oxidized approximately following a parabolic law with a parabolic rate constant kp of 7.1x10-10 g2m-4 sec-1. As revealed by SEM cross section results, three layered external oxide scale was formed. A Thermogravimetric Analyzer, Scanning Electron Microscopy/Energy Dispersive X-ray Spectroscopy, and X-Ray Diffraction and X-ray photoelectron spectroscopy were among the analytical techniques used.

Keywords: Incoloy 800H Alloy, Oxidation, Metal Corrosion

Thermochromic and Solvatochromic Behavior of Formally Divalent Phosphorus Compounds in Solutions

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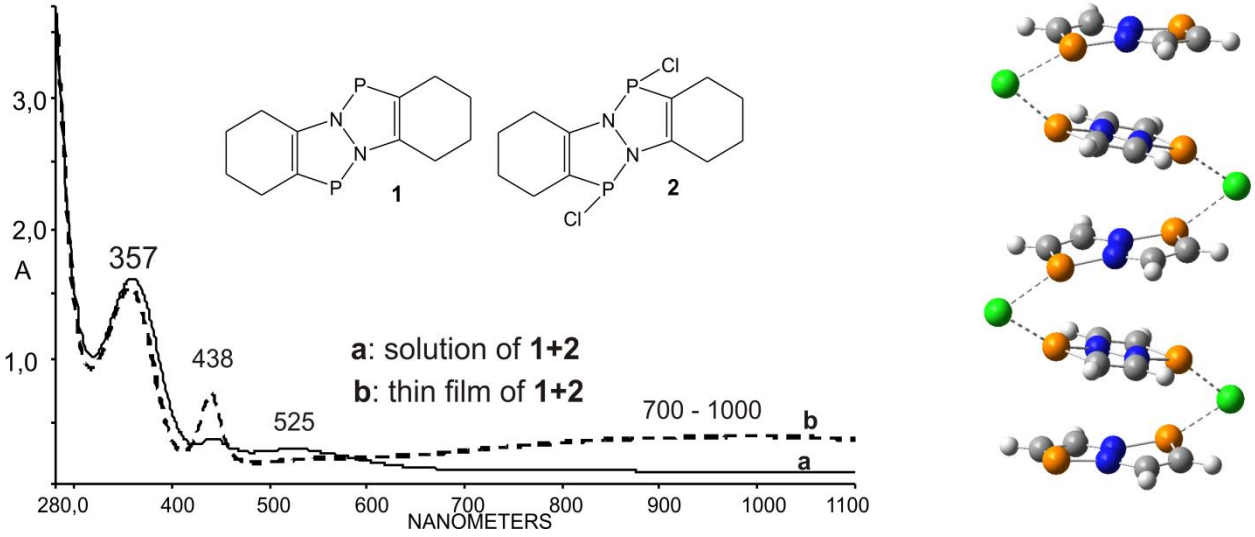
3a,6a-Diaza-1,4-diphosphapentalene (**1**) has unique heteroaromatic 10π-electron system [1], revealing easer polarizability due to induced charge transfer from one P-atom to another and 6π-aromatization of one of heterocycles. The equimolar mixture of **1** and **2** is, in fact, a P−P bridging dimer, which may be detected in diluted nonpolar solvents. Concentrated solutions contain extended conjugated associates of different length (see right figure) due to interplay between three types of interactions: a) stacking

interaction assuming a through-space delocalization of π-electrons; b) non-valent bonding interaction between bridging Cl-atoms and antibonding σ*(P-N) orbital; c) weak P-P σ-bonding.



The mixture **1**+**2** reveals thermochromic and solvatochromic properties. The electronic spectrum in THF (left figure) had a new absorption band at 525 nm, which rises in intensity with a decrease in temperature. This absorption band is in good agreement with the calculated energy (2.38 eV) of the electron transition from the HOMO of **1** to the LUMO of **2**. It is noteworthy that solvent removal from the mixture in a vacuum gave a dark-violet thin film showing a new very broad absorption band in the range of 700−1100 nm (left figure). These results conform to the concentration-dependent associations of **1** and **2** in the solution. In the cooled dilute solution, the pairs interaction of **1** and **2** is mainly observed, giving the absorption band at 525 nm. The concentrated solutions and thin film apparently contain extended conjugated associates of different length.

Like tetrathiafulvalene, **1** forms charge-transfer complex with 1,2,4,5-tetracyanobenzene displaying stacking interactions between molecules in crystal.

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Thermodynamic Properties of Redox-Isomeric Cobalt Complexes with O-Semiquinonic Ligands

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Extensive studies have been performed on bistable molecules, which can transform their physical properties with external stimuli, for developing molecule-based sensors. It is known that some transition metal complexes with two semiquinone ligands undergo a redox-isomeric (valence-tautomeric) interconversion induced by temperature, light and pressure. The paper presents results of thermodynamic studies of some complexes which exhibit redox-isomerism.

Keywords: Thermodynamic Properties, Redox-Isomerism, Cobalt Complexes with O-Semiquinonic Ligands

Performance Evaluation of Carbon Fiber Assisted Cabin Dryer During the Drying Process of Strawberry Slices

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Drying of food stuff is one of the most common preservation methods in food industry. Generally drying process carried out in convective type dryers or using solar power. However these techniques require relatively high energy with low efficiency. In the present study, a novel drying system; namely carbon fiber plate assisted drier was employed for drying process of strawberry slices. Strawberry slices were placed on the tray in the form of thin layer, and dried at three different process temperatures (55°C, 60°C, and 65°C) with 0.8±0.05 m/s air velocity. Drying times needed to reach the total dry matter content of 7%±1 were determined as 318, 258 and 251 min, for the drying temperatures of 55°C, 60°C, and 65°C, respectively. The effective diffusivity coefficient (Deff) was determined in the range of 4.81×10-10 and 5.4×10-10 m2/s for drying temperatures. The energy consumptions showed similarity for three drying temperatures ($p>0.05$). However, the energy efficiency values were decreased as the drying temperature decreased (26.82 % for 55°C, 31.66 % for 65°C) ($p<0.05$). Similarly, the specific moisture loss ratio (gr removal water/ J given energy) showed a decreasing trend as the drying temperature decreased (0.267 for 55°C, and 0.317 for 65°C). The destroyed exergy amounts showed similarity ($p>0.05$) for the drying temperatures, which were 107.36 kJ for 55°C, 107.92 kJ for 60°C and 108.96 kJ for 65°C, whereas the exergy efficiency was maximum (29.8 %) for 65°C. By taking into account of the performance evaluations of the drier, the most efficient drying temperature for strawberry slices in the carbon fiber assisted cabin drier was concluded as 65 °C.

Keywords: Drying, Energy, Exergy, Carbon Fiber, Efficiency

Evaluation of Rheological and Thermal Properties of Dietary Fibre Enriched Gluten Free Doughs

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The aim of this study was to evaluate the effects of pea dietary fibre on the rheological and thermal properties of gluten-free dough based on buckwheat, rice flour and potato starches with guar gum. In order to obtain the rheological behaviors of gluten free doughs'; flow ramp, strain sweep test, frequency sweep test and oscillation temperature ramp test were performed on each sample. Also differential scanning calorimeter (DSC) was used to determine thermal property parameters such as gelatinization temperature and gelatinization enthalpy. According to the flow behavior tests, all batters showed pseudo-plastic behavior and Power Law model was the most suitable model to represent the rheological characteristics of dough's. Frequency sweep test results showed that an increase in buckwheat flour ratio resulted in an increase in elastic modulus (G′) and viscous modulus (G″) values of the dough samples. Increasing of pea dietary fibre levels caused late onset of gelatinization and also presence of dietary fibre caused a decrease of gelatinization enthalpy.

Keywords: Gluten-Free Dough, Rheology, Thermal Properties

Optimization of Chemical Vapor Deposition Process Parameters for Aluminizing

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Ni-based super alloys such as Inconel 738LC, MAR-M-200, CMSX-4 are used in the hot sections of industrial gas turbines due to their excellent mechanical strength and creep resistance at high service temperatures. To protect turbine blades from thermo-mechanical failure, oxidation/corrosion resistant coatings are necessary to extend the life time. For this purpose, diffusion coatings including chromized, siliconized, aluminide coatings have been studied by different groups. Among them, aluminide coatings are widely preferred in turbine applications due to its ability to form stable oxides that prevent oxygen diffusion to substrate materials. Aluminide coatings are generally applied by pack cementation, above-pack-process, slurry and chemical vapor deposition (CVD) methods. Although pack cementation is simpler and cheaper coating method, CVD has advantages over other coating processes because of its high ability to control process variables such as process gas flows and their ratios, chamber temperature, chlorinator temperature and system pressure; hence coating microstructure and homogeneity in composition. In this research, effect of CVD process variables on gas phase aluminizing are investigated to obtain highly pure and chemically uniform β phase NiAl compound with high Al content (35 - 55 %at.) aluminide coating on IN738LC substrates. Before CVD process, turbine blade surfaces are analyzed by linear profilometer to observe influence of surface roughness on aluminide coating microstructure and aluminum uniformity through substrate. Also substrates are weighed by precision scales. After aluminizing process, surface roughness and weight measurements are conducted again to observe any change due to CVD process. Coating microstructures, phases and chemical compositions are characterized by scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), wavelength dispersive spectroscopy (WDS). Cross section analysis are performed by SEM to measure aluminide coating thickness consist of β-NiAl and interdiffusion zone (IDZ). Effect of CVD parameters on β-NiAl to IDZ ratio are investigated to obtain higher ratio such as 5:1. For identification of coating phases, X-ray crystallography (XRD) technique is used to observe formation of undesirable Ni – Al coating phases such as Ni2Al3, Ni3Al.

Keywords: Diffusion Coatings, Aluminizing, Chemical Vapor Deposition

Aluminide Coating Simulations

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Nickel-based super alloys are generally preferred as substrate materials for gas turbine blades due to their high creep resistance and excellent mechanical strength at high temperatures. To improve high temperature oxidation and corrosion resistance of these substrate materials, aluminide coatings are typically used as protective coatings, thereby improving lifetimes of advanced gas turbine blades. For clean and pure coating of aluminum at substrate surface, chemical vapor deposition method (CVD) is widely used for turbine blade coatings. The aim of this research is to develop a simulation model using DICTRA that is compatible with experimental CVD operations. After this aim is achieved, the ultimate goal is to use this simulation model to provide input parameters for experimental CVD operations. In this research, two models were compared and named as “Diffusion Couple Model” and “Al Deposition Model”. The “Diffusion Couple Model” simulates diffusion between IN 738LC and Al diffusion couple while the “Al Deposition Model” simulates surface growth and interfacial diffusion during Al deposition. Coating thickness, composition and phase profile results of both models were compared with experimental results, and most compatible model was determined. Using the model

with best compatibility, effect of CVD operation time, temperature and deposition rate were investigated using DICTRA software. Main criteria were to create a pure and uniform β-NiAl zone with high Al content (35-55 %at.), and to maximize β-NiAl to interdiffusion zone thickness ratio to improve the lifetime and mechanical properties of IN 738 LC turbine blades. After the simulations were completed, results were compared with experimental CVD results and simulation model was modified to carry out more compatible results with real life CVD operations.

Keywords: Aluminide Coating Simulations, Nickel Based Superalloys, Turbine Blades, DICTRA, THERMOCALC

Investigation of The Mechanical Bonding Effects on Mechanical Performance of The Adhesively Bonded Composite Materials

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The purpose of this study is investigating mechanical bonding effects on adhesively bonded composite materials for different adhesive lengths (l_a), number of bolts (n), *E/W* values and various bolt torques (T). In this study, the damage behaviors of composite plates were investigated using experimental method. Glass-fibre reinforced epoxy laminated composites $(0/90)_6$ were used as composite material and samples dimensions were *100* x *20* x *2.3 mm*. For adhesion process, two components of epoxy adhesive *EA 3430* was preferred and *M5* steel bolts were used for mechanical bonding. Three different tightening torques (*T=5, 10, 15 Nm*) were chosen for the bolted joints in the experiments. Also different adhesive lengths (l_a*=20, 30 mm*) and *E/W* values (0.5, 0.75) were chosen. Tensile test was applied through a centroidal axis on each sample. Load – displacement curves were drawn and datas were shown with graphics. Results were commented about adhesive length (l_a), number of bolts (n), *E/W* values and bolt tightening torques (T) in this study.

Keywords: Composite Materials, Mechanical Bonding, Adhesively Bonding, Torque Effect, Adhesive Length

The Experimental and Numerical Investigation of Fracture Behavior of Woven-Fabric Reinforced Glass/Epoxy Laminates Including Different Crack Geometries

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Many composite components in aerospace structures are made of flat or curved panels such as laminated composite materials. In this study, the fracture behavior of laminated composite materials has been investigated experimentally and numerically by using middle-cracked tension (MIT) and single edge notched tension specimens. The CMOD (crack mouth opening displacement), which is derived from the linear elastic fracture mechanics is measured experimentally. The fracture toughness KIC of manufactured laminated woven-fabric-reinforced glass/epoxy composite was analyzed and determined by using DIC (Digital image correlation) technique. A single camera for in-plane displacement field measurement and then strain computation was used in this technique to obtain the critical strain energy release rate (SERR), GIC. Single edge notched tension specimens were used to get critical SERR by compliance calibration method. Finite element analyses are carried out by ANSYS software package program and 2-D models have been used to obtain the fracture parameters

of manufactured laminated woven-fabric-reinforced glass/epoxy composites. Results show a good agreement between experimental and numerical solutions.

Keywords: Woven-Fabric-Reinforced Glass/Epoxy Composites The Stress-İntensity Factor, DIC Technique, CMOD, Finite Element Method

Effects of Talc Additions on Thermal Conductivity and Decomposition of Rigid Polyurethane Foams

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Rigid polyurethane foams are used in thermal insulation applications due to their low thermal conductivities. Meanwhile, different inorganic minerals as fillers are incorporated into rigid polyurethane foams, especially to reduce production costs. However, it is required to investigate the effects of fillers on the properties of foams before their usage in industrial applications.

In this study, talc which is a cheap inorganic mineral was added into rigid polyurethane foams up to 15 % in mass. Effects of talc additions on thermal conductivity and decomposition of rigid polyurethane foams were investigated. Experimental results showed that talc additions slightly increased the thermal conductivities of the foams. However, thermal stability of the foams was enhanced with the talc additions.

Keywords: Rigid Polyurethane Foam, Talc, Thermal Conductivity, Thermal Decomposition

Investigation the Fire Behavior of Rigid Polyurethane Foams Filled with Talc

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In thermal insulation applications, rigid polyurethane foams are preferred due to their low thermal conductivities. However, the price of the rigid polyurethane foam is higher than that of other thermal insulation materials. Therefore, different cheap mineral matters are incorporated into the foams to reduce the production costs. Beside thermal conductivity and decomposition behavior of the foams filled with different fillers, the fire behavior of the foams should also be investigated for security of life and property.

In this study, talc was added into rigid polyurethane foams at different loadings, namely 5, 10 and 15 wt % and fire behaviors of the foams containing talc were investigated by using cone calorimeter burning test. The experimental results revealed that 5 and 10 wt % talc additions do not significantly affect the fire resistance of the foams; however it was found that the fire resistance of the foams can be enhanced with 15 wt % talc addition.

Keywords: Rigid Polyurethane Foam, Talc, Fire Resistance, Cone Calorimeter

Ferrofluid Applications on Micro Pumping Systems

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Ferrofluids are colloidal mixtures which comprise of nano-sized magnetic particles suspended in a carrier liquid. They are typically consisted of maghemite, magnetite and cobalt ferrite as magnetic materials. Preserving this suspension in a stable zone is possible with an electrical double layer or addition of surfactant. Ferrofluids have many applications on electrical, mechanical and optical systems. However, more recently, ability of being manipulated by an external magnetic field made them considerable for microfluidic systems such as micro operations, pumping and mixing [1]. Among these microfluidic systems, micro pumping systems has appeared as a critical research area. They have a potential to be applied on many biological and electronic systems [2]. Development of lab on a chip and micro total analysis systems (μTAS) for biological issues has revealed the necessity of fluid transport in micro quantities. Due to the reduction of dimensions in electronic packaging, thermal management of high heat dissipation problems has occurred and brought a micro cooling requirement. Micropumps are considered to have the ability of overcome these problems with their wide range of different actuation mechanisms. It is possible to drive ferrofluids in a micro-sized tube or channel which was actuated with an external magnetic field and the concept of micro-sized pumping attracted researchers' interest. In this study, ferrofluid based micro pumping applications available in the literature have been reviewed based on their design, actuation mechanism and maximum flow rate that can be generated.

Keywords: Ferrofluid, Microfluidic, Micro Pump, Magnetic Field, Magnetic Particle.

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Separation of Low Aromatic Hydrocabons from Mixed Aromatic Aliphatic Hydrocarbon Streams Using Ionic Liquids

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The separation of aromatic hydrocarbons (like benzene, toluene, ethylbenzene and xylenes) and aliphatic hydrocarbon mixtures, done conventionally by liquid extraction, extractive distillation and azeotropic distillation. Even though these processes are capable of separations that range from 20 to 90 wt%, they are unsuitable for the oil production industry requirements of <5 ppm. Ionic liquids have raised special interest in the last years with a number of papers supporting their potential for this separation. Nonetheless and despite their potential, separations aiming such low aromatic concentrations are not fully covered. Thus, aiming to respond to the industry challenges the use of ionic liquids on the aromatic/aliphatic separation, for the oil industry, stands as a vital and highly interesting challenge.

However, due to the large number of ionic liquids feasable to be synthesized, the selection of the most suitable candidates for the proposed work must be hampered by group contribution methods, correlations or equations of state. COSMO-RS, a novel quantum chemical approach to describe the chemical potential in the liquid phase, has become a frequently used alternative to force field-based molecular simulation methods or group contribution methods. The COSMO-RS model is the most progressive kind of a dielectric model where molecules are placed in a conductor as the reference state. Through its unique combination of a quantum chemical treatment of solutes and solvents, with an efficient statistical thermodynamics procedure for the molecular surface interactions, a efficient calculation of phase equilibrium and other thermodynamic properties are achievable. Thus, to screen the most suitable ionic liquisd, COSMO-RS was used to predict the IL/aromatic/aliphatic system partition coefficient and selectivity. The set of ionic liquids with the highest potential were than evaluated experimentally, at 303 K. The results obtained are here discussed in terms of ionic liquid cation/anion family, partition coefficient and selectivity.

Keywords: Ionics Liquids**,** Aromatics**,** Aliphatic Separation

Current-Voltage Characteristics of Schottky Barrier Diode Dependent on Temperature

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III-V group elements gained importance in producing various optoelectronics and electronic devices in recent years. Production of high speed optoelectonic communication devices, microwave and integrated circuits can be done by depositing metal films on the InP wafers. Metal- Semiconductor (MS) contacts are one of the most used rectifiying contacts. The current-voltage (I-V) characteristics of the MS contacts are generally determined by termoionic emission theory. By using this theory, barrier height (Φ_b), ideality factor (n) and saturation current (I_0) can be calculated. In recent years, many investigations are made by different researchers about metal-InP interfacial layers. These investigations improved both application area of InP semiconductor devices and made it possible to understand the physical mechanism which is effective in formation of the Schottky barrier.

In this study, current-voltage (I-V) characteristics of Ag/TiO_2/n-InP/Au Schottky barrier diodes have been investigated in the temperature range of 300-380 K. Here TiO_2 film with 120 Å thickness has been used as interfacial layer between metal and semiconductor layers. The zero-bias barrier height (Φ_{b0}) and ideality factor (n) determined from forward bias I-V characteristics were found strongly dependent on temperature. We calculated parameters of the diode, by using termoionic emission theory (TE), we have seen that the results are in accordiance with the theory**.** According to these results ideality factor (n) decrease and barrier height (Φ_{b0}) increase with an increase in temperature. Also series resistance (R_s) is calculated by using Norde method. It is seen that series resistance decrease with an increase in temperature. We have calculated the density of interface states (N_{ss}) by using I-V characteristics. Our sample showed double gaussian property. The modified Richardson constant is calculated very compatible with the theory.

Keywords: Schottky Barrier, InP, Barrier Height, Ideality Factor, TiO_2

Thermal Shock Resistance of Mullite Resulting from Kaolin and Tri-Hydrated Alumina

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Mullite (3Al2O3-2SiO2) is a very important ceramic in both area of traditional ceramics and advanced materials because it's the only stable crystalline phase in the Alumino-silicate system.

With very interesting characteristics, low expansion coefficient, high refractoriness, low thermal conductivity, good chemical and thermal stability.

Its major disadvantage is its high sensitivity to abrupt temperature change. The enrichment of Kaolin by alumina after sintering leads to the formation of mullite.

In this work we have studied the thermal shock resistance of mullite prepared locally under different conditions. The initial blending used is 60% of trihydrate alumina (Gibbsite) and 40% of Kaolin. The shaping was carried out with dry methods by uniaxial pressing under three pressures (100,80,70)MPa. After drying at 600°C, pre-cooked samples were sintered at 1600°C for 1h.

Differential thermal analysis coupled to a thermogravimetric analysis revealed different transformations and reactions occurring during the blend cooking. The spectra of X-ray diffraction showed the presence of mullite.

A water-quenching technique was used for thermal shock tests.

The specimens were heated at different temperatures (100 ° C to 500 ° C), and held at each temperature for 10 min. Then, the heated specimens were dropped by free fall into a water bath, which was maintained at 25°C with a thermostat. The residual strengths of the quenched specimens were determined in a three-point bending test.

The results showed that the critical temperature difference ΔTc depends on pressure density and porosity of the samples.

Keywords: Kaolin, Mullite, Sintering

Electron Concentration Effects of CuAlNi Shape Memory Alloy

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In this study, electron concentration (e/a) effects on CuAlNi shape memory alloys with different Ti amount were investigated. By increasing of electron concentration, transformation temperature of CuAlNi alloy increased. The electron concentration of CuAlNi alloys were changed by addition of Titanium element. By 1,68 e/a ratio, it was not seen any transformation. Microstructure and crystal structure of alloys changed seriously. Ti element and rising e/a caused to occurs precipitate phase in CuAlNi shape memory. With increasing of Ti, the size of precipitates enlarged. The transformation temperature of CuAlNiTi alloys in accordance with microstructure. Large size of precipitate was barrier to show martensitic transformation of CuAlNi shape memory alloy.

Keywords: Titanium, Microstructure, Shape Memory, Martensitic

Thermophysical Properties of 1-Butyl-3-Methylimidazolium Hexafluorophosphate at Wide Range of State Parameters

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An expanding interest in ionic liquids has been observed during the last decade. IL's are composed of bulky ions, have very small vapor pressure, low melting point, high solvating capacity, high ionic conductivity and high thermal stability, which make them attractive for practical applications. During the many years, various ILs were investigated using the different quality of substance, measuring methods etc. The quality of ILs at the first years of study also were not enough investigated. This problem were played negative role during the experimental investigations. At the results, many different experimental results were obtained by the various authors and uncertainties of these investigations have big deviation between of them.

In this case, our research group begins to carry out fundamental thermophysical property analysis of classic ILs. New accuracy (p,ρ,T) measurements, viscosity, heat capacity, speed of sound of 1-butyl-3-methylimidazolium hexafluorophosphate [BMIM][PF_6] were done at T = (273.15 to 413.15) K temperatures and from ambient pressures up to p =140 MPa. Density ρ measurements were carried out using an Anton-Paar DMA HPM vibration-tube densimeter in the high-pressure region and an Anton-Paar DSA 5000M model at ambient pressure, respectively, with an estimated experimental relative combined standard uncertainty of $\Delta\rho / \rho = \pm$ (0.01 to 0.08) %. The dynamic viscosity η was measured in a temperature range T = (273.15 to 373.15) K at ambient pressure using an Anton Paar SVM 3000 Stabinger viscometer with an estimated experimental relative combined standard uncertainty of $\Delta\eta / \eta = \pm$ 0.35 %. The results were compared with the published literature values and an empirical multiparameter equation of state which covers the high-pressure region as well was established.

Additionally, the specific heat capacity at constant pressure c_p of [BMIM][PF_6] at temperatures T = (273.15 to 413.15) K and at ambient pressure were measured using the differential scanning calorimeter Pyris 1 DSC with an experimental relative combined standard uncertainty of $\Delta c_p / c_p = \pm$ 0.5 %. Using these data, other thermophysical properties, like specific heat capacities at constant volume c_V, speed of sound u, and isentropic exponent κ_s at temperatures T = (273.15 to 413.15) K and pressures p up to 140 MPa were calculated.

Keywords: Ionic Liquid, Density, Heat Capacity, Viscosity, 1-Butyl-3-Methylimidazolium Hexafluorophosphate

Carbon Dioxide Solubility in 1-Octyl-3-methylidazolium tetrafluoroborate at High Pressures and Temperatures

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Over the last decades a number of so called greenhouse gases have shown an increasing concentration in the atmosphere. The greenhouse gases absorb infrared energy radiated from the earth, which results in an increase in the temperature of the troposphere. One of the most important greenhouse gases at the present time is carbon dioxide. The continued burning of fossil fuels has and will continue to increase CO_2 in the atmosphere.

There are various technical processes which in principle can be used for the capture of CO_2. One of these is the solvation of CO_2 into liquids. Ionic liquids (ILs) are regarded as environmentally- benign solvents due to their very low vapor pressure and can be applied for defusing the CO_2 problem within the atmosphere. The prediction of CO_2 solubility in ILs is a fundamental step toward the development of simulation tools to aid in the process calculations prior to industrial applications.

We report about experiments to determine the high pressure solubility of CO_2 in 1-octyl-3-methylimidazolium tetrafluoroborate [OMIM][BF_4] IL at various temperatures at T=(273.15 to 413.15) K, which are performed in a stainless steel measuring cell in equilibrium by using the isochoric method. Experiments were carried out in four different pressure steps: in the first step, the maximum possible pressure (about 5 MPa) is created in the gas reservoir. The other steps with maximum pressure are: second step - about 3 MPa, third step – about 1.5 MPa, and the final step – about 0.5 MPa. The temperature dependency of Henry's law constant was calculated. Thermodynamic properties of solution such as the free energy of solvation $\Delta_{sol}G$, enthalpy of solvation $\Delta_{sol}H$, entropy of solvation $\Delta_{sol}S$ and heat capacity of solvation $\Delta_{sol}c_p$ were calculated at various temperatures T to evaluate the solute- solvent molecular interactions. The measured CO_2 solubility in [OMIM][BF_4] as a function of temperature and pressure were fitted to a virial equation using mole fraction dependence.

Keywords: Greenhouse Gases, Carbon Dioxide, Thermodynamic Properties, 1-Octyl-3-Methylimidazolium Tetrafluoroborate, Henry Law

Analysis of Heat-Spreading Capability of Encapsulated Annealed Pyrolytic Graphite Cores

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The capability to efficiently transfer the heat away from high-powered electronic devices is a ceaseless challenge. More than ever, the aluminium or copper heat spreaders seem less suitable for maintaining the component sensitive temperature below manufacturer operating limits. Technology-push high-

conductivity materials, such as Thermal Annealed Pyrolytic Graphite is an attractive alternative to conventional solid conduction without the gravity dependence of a heat-pipe solution. Despite, the ultrahigh performance rising of APG core, close to 4 times of copper one, is restricted to in-plane thermal conductivities which can be 200 times higher than its through-the-thickness conductivity. So a lower cross-plane thermal conductivity or a higher interlayer thermal resistance than anticipated would compromise APG-based material as efficient heat spreaders. In order to analyse the sensitivity of these parameters on the effective thermal performances, an analytical model for predicting the temperature distribution over an APG flat-plate was developed. Its relevance was compared to numerical simulations as well as experiments for a set of boundary conditions.

Keywords: Annealed Pyrolytic Graphite (APG), Analytical Model, Electronic Components

Thermophysical Properties of Çeşme Seawater Sample

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Çeşme is administrative centre of the district the extreme western end of Turkey, in the Çeşme peninsula. It is located 85 km west of the city of Izmir, the largest metropolitan center in Turkey's Aegean Region [1] and comprised wholly within Izmir Province. Çeşme is a popular holiday resort and the district center, where two thirds of the district population is concentrated. The water reservoir of this region located between Black and Mediterranean Seas, where have high-level transport and private ship navigations, which of course take also various ecological pollution of seawater quality any time. The high number of tourists coming to Çeşme any seasons and in this case, the swimming quality of seawater is important and necessary for the investigations. For this purpose, the seawater sample was taking from the north part of Çeşme near Boyalik Beach (38°19'37.35"N and 26°19'37.91"E) for the chemical and thermophysical analysis. This investigation is continuing of our research works in the filed of thermophysical properties of natural seawater [2-5].

We will present at the conference all studied properties of this sample. At the first, the Practical Salinity measurements with three significant digits using the “Autosal” Laboratory Salinometer (Model 8400B, Canada) were determinated. After this, the chemical analysis (cations and anions) of this sample were analysed using the IRIS Intrepid II Optical Emission Spectrometer and DX 100 ion chromotography. Density ρ measurements at ambient pressure were studied using an Anton-Paar DMA HPM vibration-tube densimeter at T=(273.15 to 413.15) K, also an Anton-Paar DSA 5000M densimeter at T=(278.15 to 343.15) K. The estimated experimental relative combined standard uncertainties of both installations were between $\Delta\rho/\rho = \pm$ (0.001 to 0.03) %. The next step was the dynamic viscosity η measurements at ambient pressures and temperatures T = (278.15 to 373.15) K using an Anton Paar SVM 3000 Stabinger viscometer with an estimated experimental relative combined standard uncertainty of $\Delta\eta/\eta = \pm$ 0.35 %.

The vapor-liquid equilibria (VLE) measurements of Çeşme Seawater sample were measured using the two high-accuracy static experimental set ups. The glass cells are used for vapor pressures lower than ambient pressure at temperatures ranging T=(274.15 to 323.15) K and the metal cell for vapor pressures at T=(323.15 to 413.15) K. The experimental uncertainty of the pressure in glass cells was between $\Delta P = \pm$ (1 to 30) Pa. The vapor pressure using the metal cell is measured with three various Omega-Keller pressure transmitters (SERIE 35 X HTC) ranging from a maximum pressure of 300000 Pa with uncertainty $\Delta P = \pm$(400 to 1500) Pa, to a pressure of 1000000 Pa - $\Delta P = \pm$(1000 to 5000) Pa and to a pressure of 1600000 Pa - $\Delta P = \pm$(2000 to 8000) Pa, respectively.

The (p,ρ,T) measurements of Çeşme Seawater sample at T=(273.15 to 413.15) K, pressures up to p=100 MPa were carried out using the Anton-Paar DMA HPM vibration-tube densimeter [4], which

based on the dependence of the period of oscillation of a unilaterally fixed U - tube (Hastelloy C - 276) on its mass. The temperature in the measuring cell where the U – tube is located is controlled using a thermostat (F32 - ME Julabo, Germany) with an error of ±10 mK and is measured using the (ITS-90) Pt100 thermometer (Type 2141) with an experimental error of ±15 mK. The four various pressure transmitters P-10 with max. measuring range in p=(0.25, 2.5, 25 and 100) MPa with a relative uncertainty of 0.1 % were used during the measurements.

An empiric equation of state for fitting of the (p,ρ,T) data of Çeşme Seawater sample has been developed as a function of pressure and temperature. Additionally, the heat capacity measurements of sample at ambient pressure and at temperatures T=(273.15 to 413.15) K were carried out using the DSC techniques. The (p,ρ,T) and heat capacity values of seawater sample were used for the calculation of the thermophysical properties of samples, such as isothermal compressibility $\kappa T/MPa^{-1}$, isobaric thermal expansibility p/K^{-1}, difference in isobaric and isochoric heat capacities $(cp-cv)/Jkg^{-1}K^{-1}$, thermal pressure coefficient $\gamma/MPaK^{-1}$, internal pressure pint/MPa, isobaric heat capacity $cp/Jkg^{-1}K^{-1}$, isochoric heat capacity $cv/Jkg^{-1}K^{-1}$, speed of sound u/ms^{-1} and isentropic exponent κs in the wide range of pressures and temperatures using the developed method by our group [6].

The obtained values were compared with the standard seawater properties in the same salinity [7] and with the IAPWS-95 pure water properties [8].

Keywords: Seawater, Salinity, Density, Thermophysical Properties.

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Roughness of the Punch in Contact with Steel Sheet

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The functional role of a surface depends on a certain number of factors, in particular on surface quality (sealing, sliding, friction etc…). The roughness plays a very important part in very varied fields such as in mechanics where it is opposed to the intimate contact between the antagonistic bodies, it creates friction and wear. In a tribological system representing a contact between punch and sheet we noticed the aspect change on the punches places where the crushing of sheet steel was exactly carried out. Then we were interested to evaluate the roughness of theses surfaces punches where the crushing of the steel sheet has been exactly made. So we were interested in assessing the roughness of places to

see if it correlates with the coefficient of friction. The main aim of our present work is to test a low carbon steel in contact with steel punches tool with faces superficially naked. Therefore we determined the coefficient of friction, controlled the transfer matter and the produced consequences at the interfaces of the punches and the sheet crushed. The study was expanded by controlling the roughness of the punches after test to determine the relationship between friction and surface quality. To do this we used the bipoinçonnement method and a roughness Homel test that allowed us to collect several profiles and parameters characterizing the surface condition of the punches.

Keywords: Roughness, friction, wear, transfer, matter

Effect of Wear on Microhardness Changes of Alloy Steels Rubbing on X200Cr13 Steel under Dry Conditions

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Microstructure evolution and mechanical properties of alloy steels rubbing on X200Cr13 steel under dry conditions were investigated. Tests were carried out at 2N applied force; they were performed in the aim to characterize together the worn surface and the depth affected by the wear. These measures justify a possible structural surface and/or in depth hardening. Hardness tests are taken at two locations over a length of 5 mm. The microhardness values were taken over a distance of 5 mm at the centre of the sample and 5 mm at the edge of the worn surface under both normal forces, 4 and 8 N. In spite of the fluctuating values of microhardness, we note that the microhardness in the centre of the samples is much higher than that of the edge. The difference between the two zones is of the order of 100 HV. The worn surface at 8 N is greater than the worn surface at 4 N. In this case, the increase in normal force causes an increase of 160 HV to 200 HV in the same areas.

Keywords: Icrostructure, Microhardness, Surface Worn, Wear

Study of the Dynamic Proprieties of Protection System against the Vibration

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The vibration is a phenomenon, governed by linear or nonlinear oscillations. Mechanical vibrations were considered in the past as parasitic phenomenon and have a minor disadvantage. Without regard of their causes, the vibrations have harmful effects on the mechanics structures. On the one hand, the intensity of vibration sources around us is increasing. Some of the reasons for this phenomenon are: increasing speeds of machinery, proliferation of off-road vehicles and four-cylinder internal combustion engines, continuous improvements of cutting inserts allowing heavier cuts on machine tools, etc. On the other hand, tolerances on allowable vibration levels are becoming more and more stringent. This is due to higher and higher required precision, continuously improving sensitivity of measuring instruments, proliferation of light (but strong) structures that are more prone to vibration, competitive pressure on improving human comfort both in stationary structures and in vehicles, etc. To accommodate these contradictory phenomena, vibration protection means are continuously improving [1].

Vibration isolation is one of the vibration control techniques whereby the source of vibration excitation and the object to be protected are separated by an auxiliary system comprising special

devices called vibration isolators or vibration isolating mounts. The effect of vibration isolation amounts to weakening of dynamic coupling between the source and the object, thus reducing transmission of unwanted vibration excitations to or from the object. The weakening of dynamic coupling may also result in ‘‘side’’ effects such as increasing static displacements between the source and the object; increasing low frequency and transient relative displacements between the source and the object; and in increases in size, weight, and cost of the installation. Installation of several connected units on compliant vibration isolators increases misalignment between these units, which is usually undesirable. Thus, in many cases a multi-parameter optimization is required to provide acceptable vibration reduction effects while satisfying other constraints [2].

Traditional "classical" methods of protection, based upon utilizing elastic passive and dissipative elements, turn out to be inefficient in many situations and cannot completely satisfy the complex and often contradictory claims imposed on modern vibration protection systems which must provide high performance at minimum dimensions [3].

For these reasons, active vibration protection systems, which are actually systems of automatic control with independent power sources, are widely used nowadays.

The dynamic modelling of vibration protection systems is also complicated by the necessity to include nonlinearity. The classical linear theory of elastic suspension, implying that each isolator possesses linear elastic and dissipative properties, is limited due to dimensional constraints.

The present work consists in modeling an active vibration protection system mounted on a driver's seat. This system will protect against vibrations transmitted to him from the vehicle due to bad road conditions. The active protection system used consists of a seat which is based on a pneumatic support connected to a control loop whose energy source is a pneumatic-system (or an air compressor) gives the flow air required for functioning and for regulation. We have modeled the système and exited it using noises. The developed model presents a great stability agains exitations. System reliability is mainly due to the stability of the excitement and calculation accuracy, and analogies established to the mathematical model

Keywords: Vibrations, Protection Systems, Modeling, Transfer Function, Asservisment

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Characterization of Powder Metallurgy-Processed AZ 91/Nickel-Coated Graphite Composites

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In the present paper, the microstructure and mechanical properties of AZ91 Mg chips/Nickel-coated graphite composites obtained by two solid-state recycling processes including cold-pressing followed by hot extrusion were studied. Nickel-coated graphite particles were selected for reinforcement purposes due to the well-known lack of affinity between magnesium and carbon. In the experiment, AZ91 Mg chips was reinforced with 0 %, 5 %, 10 %, 20 % and 40 % by weight of Nickel-coated graphite and then compacted at 1600 MPa followed by hot extrusion at 623K at an extrusion ratio of 9:1 in air. The interfaces between Nickel-coated graphite particles and AZ91 Mg matrix alloy were

very clean. The wear resistance improved with the addition of Nickel-coated graphite particles although some reduction in microhardness was observed.
Keywords: AZ91 Mg Chips/Nickel-Coated Graphite Composites, Solid-State Recycling, Density, Wear

Analytical Study of Natural Sandstone from Local Region Using Non-Destructive Techniques

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The variety of sedimentary rocks such as sandstone in abundance represents a big importance in the industry and road infrastructure. Aggregates are the major constituents of concrete and typically occupy a large proportion of its volume. The concrete's properties are mainly influenced by the quality of the aggregates.

Sandstone is a widespread aggregate resource and it is increasingly being used in concrete construction around the world.

The geological properties of this sedimentary rock are fairly diverse such as quartzite aggregate that may produce a range of hardened concrete properties. Therefore, it is important to study and characterize the aggregate to obtain predictable concrete properties.

Firing of sandstone was carried out in the temperature range 25 to 1000 °C under atmosphere and the mineralogical transformations were investigated with X-ray diffraction (XRD), Thermo Gravimetric Analysis (TGA), Differential Thermo Gravimetric Analysis (DTGA), Differential Scanning Calorimetry (DSC), Optical Microscopy and Raman Spectroscopy.

The predominant phases emerge on the spectra of X- ray diffraction (quartz and some minor elements such as calcite and phyllosilicate). Thermal analyses of sandstone by TGA/DTGA and DSC confirmed the presence of the same phases and the overall appearance of the DSC curves is similar to that of DTGA curves.

The focal point of our study is to show the importance of thermal analysis techniques (TGA/DTGA and DSC) and compare the results to conventional standard techniques: XRD, Optical Microscopy and Raman Spectroscopy in characterization study methods for sandstone in particular and rocks in general.

Thermal analysis is powerful tools in determining mineral phases and an unavoidable means and meets the needs of geologists and the road infrastructure.

Keywords: Sandstone, TGA/DTGA, DSC, XRD, Raman Spectroscopy

Characterization of Transparent Glass-Ceramic (MAS) Developed by the Controlled Crystallization Process

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Among all the new materials, one group plays a very special role: glass ceramic materials. They offer the possibility of combining the special properties of conventional sintered ceramics with the distinctive characteristics of glasses. Glass ceramic was originally developed for their thermo-

mechanical properties, many studies have quickly oriented to transparent materials, firstly in an aesthetic aim then in order to develop glass ceramics with various optical properties.

The purpose of this study was the synthesis of magnesium aluminum silicate glass ceramics in the system MgO-Al2O3-SiO2. Glass ceramics formed by controlled crystallization of MgO-Al2O3-SiO2 (MAS) parent glasses are well-known for their low thermal expansion and transparency. In order to promote bulk crystallization, it is necessary to add nucleating agents like TiO2 and P2O5 to the glass composition leading.

In this work, several characterization tests were performed by XRD, DTA, Micro hardness, SEM, this, is to highlight the amorphous structure of the starting glass, or to be able to determine the protocol of controlled devitrification, micro indentation was used to compare the mechanical properties of glass, starting with those of the developed ceramic.

Keywords: MAS Glass Ceramic, Crystallization, XRD Analysis, Micro Indentation

Characterization of the Thermal Contact Parameters in an Airplane Braking System Using Inverse Methods

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In this paper, we present a simultaneous estimation of the heat flux generated by friction and the thermal contact resistance under a real airplane braking conditions using an inverse method. The estimation is performed considering an assumption of 1D transient model and multiple interfaces. In order to validate this assumption, 1-D direct model is developed and compared to an analytical quadrupolar model. This model takes into account of a non-perfect description of the thermal contact (i.e. two functions to estimate: Heat generated heat flux, Thermal contact resistance for each interface). Then, a numerical study of the sensitivities of the problem is presented. An analysis of the feasibility of the estimation of the parameters is conducted. In a second time, an estimation using numerical data is performed using the current mechanic assumptions on the generated heat flux

Keywords: Estimation of Thermal Contact Parameters, Airplane Braking, Inverse Methods

Tribological Behaviours of ZA27/Graphene Nanocomposites

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In this study, ZA27/Graphene nanocomposites the samples were fabricated by powder metallurgy technique. ZA27/Graphene nanocomposites with combined % reinforcement of, 0.125%, 0.25%, 0.5%, 1%, 2% and 3% with equal weight % of Gr. Mechanical milling was carried out at the durations of 15 min for mixing of composite powders. The abrasive wear behaviour of nanocomposites was investigated using ball on disc wear test at different loadings of 2 and 10 N. The microstructures of these composites were characterized by a scanning electron microscopy (SEM) with energy-dispersive X-ray spectroscopy (EDS) The worn surfaces were analysed by SEM Results of the wear tests

revealed that the wear rate and wear resistance of nanocomposites decreased with an increase in the Gr content. The best wear resistance was obtained at 3 wt % Gr nanoparticle reinforced nanocomposites.

Keywords: ZA27, Gr, Nanocomposite, Wear, Tribology

Wear Investigation of Al2024/SiC Composites by Response Surface Methodology

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The effect of SiC particles and applied load on the dry sliding wear behavior of Al2024 alloy composites produced by hot pressing method has been investigated. The percentage of reinforcement and was varied from 0% to 60%. The applied load was changed from 10 N to 20 N. The wear behavior of composites was investigated by ball on disc wear tests. Response surface methodology has been used to plan and analyze the experiment. The regression model was developed for wear rate of dry sliding wear. The results concluded that the amount of SiC reinforcement into the Al2024 matrix is the most important parameter and the decreasing of applied load improves the wear rate.

Keywords: Metal Matrix Composites, Ball-on-Disc Wear, Response Surface Methodology

Effect of Fluid Flow Rate on the Thermal Performance of a Nanofluid Based System for Electronics Cooling

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Nanofluids are liquid suspensions of particles with at least one of their dimensions smaller than 100 nm. After the pioneering work of Choi [1], nanofluids show a huge potential for thermal exchange systems in various industrial applications such as transportation, electronics cooling, energy storage, mechanical applications [2]. As one of them, electronics cooling gains more and more importance due to achieving an enhanced thermal management. Techniques such as impinging jets, two-phase flow in microchannels, spray cooling, heat pipes are suggested for managing the heat dissipation [3]. Although there are several studies on cooling of electronics by using nanofluids, only a few of them is related with CPU cooling [4].

The aim of this experimental study is to investigate the effects of using nanofluid and the rate of fluid flow on the cooling performance of CPU-Cooling System, working with Al2O3-water nanofluid. Cooling system consist of three components, namely water tank, cooling fan and CPU. Experiments were carried out with 1% vol. concentrated Al2O3-water for three different flow rates at a constant fan speed. Then the results were compared with distilled water. It is observed that the temperature of CPU (base temperature) decreases with the decreasing flow rate. At the highest flow rate, the results show that there is almost no significant difference on the base temperature for both nanofluid sample and distilled water. For other mass flow rate values, we found that the base temperature has lower values for nanofluid sample comparing with water.

Keywords: Nanofluids, Electronics Cooling, Heat Transfer

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Relationship between the Surface Roughness and the Glass Erosion Duration

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In this paper we presented a semi empirical relation between the sand blasting duration (t) and the surface roughness (Ra). This relationship is valid as the erosion process does not reach the stage corresponding to the saturation state erosion. We notice that we identify three stages during eroding, according to their optical transmission and roughness. We establish approximate limits for each stage. We noticed that the best fitting function of the transmission and roughness curves is that of the Boltzmann function. However, the glass erosion process is essentially attributed to the first and the second stage which were differentiated by the surface roughness value (Ra=0.34μm), corresponding to the optical transmission value (T= 71%). So the erosion process is relatively modeled to these two stages.

Keywords: Modeling, Glass, Erosion, Sand Blasting, Surface Roughness, Transmission

Influence of the Sand Mass and Grain Size on Some Properties of a Soda Lime Glass Subjected to Sandblasting

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Samples of a soda-lime glass are subjected to erosion tests to study the influence of the sand masses and grain size on some properties. Tests are carried out on a horizontal sand blower device at a constant speed (25 m/s) and constant angle of incidence (90°). The projected sand masses range from 5 to 120 g and the sand sizes are 300, 1000 and 1700 microns. Microscopic observations show that the damaged surface and the roughness increase as the particles size and the sand masses increase. As an indication, the arithmetic roughness Ra goes 0.045 (initial state) to 11.56 μm for a projected sand mass of 120g and a grains size of 1700 microns. The rate of erosion, the optical transmission and mechanical strength decrease considerably. These parameters reach the following minimum values: (12.24%, 0.4 mg / g and 9.56 MPa), compared to the initial values: 91.5%, 2.1 mg/g and 117 MPa.

Keywords: Soda Lime Glass, Erosion, Surface State, Properties

Thermal Decomposition of Barium Strontium Squarate Hydrate

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The title complex of [Ba0.35 Sr0.65 (HC4O4)2 (H2O)5] 0.5 H2O (BSHSq) was prepared under hydrothermal condition and characterized by EDS, IR, RAMAN spectra, and X-ray single diffraction data. The thermal decomposition of BSHSq has been investigated until 600°C, under flowing air with the TG and TDXD techniques. The content in water molecules (5.5) in the precursor, found from the TG curve, agrees with that calculated from the structure analysis. The decomposition takes place in a four stage process. Starting from room temperature until 50°C, there is a weight loss of 22.049% due to the departure of 5.5 water molecules, which corresponds to the chemical formula [Ba0.35 Sr0.65 (HC4O4)2]. The decomposition of anhydrous BSHSq occurs between 230 and 360°C in three steps. The first two steps occur in the temperature ranges 250-290 and 290-360°C to give intermediates having the tentative compositions [Ba0.35 Sr0.65 (HC4O4)(HCO3)] and [Ba0.35 Sr0.65 C4O4], respectively, the latter then decomposing between 360 and 600°C to give the end product. The end product consists of Ba0.5Sr0.5 CO3, BaCO3, all the phases are identified by X-ray diffractometry.

Keywords: Thermal Decomposition, X-Ray Diffractometry, Barium, Strontium, Squarate

Thermodynamic Study on the CVD Formation of Boron Nitride

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Boron nitride (BN) has different kind of crystal structures such as amorphous, turbostratic, rhombohedral, würtzit, hexagonal and cubic. Standard free energy, equilibrium constants and free energy at 1000 C in the reactions of BN formation were calculated before the experiments. Boric acid H3BO3 and urea CO(NH2)2 was used as reactants in the reactions, the dense pure nitrogen as precursor was fed to the quartz reactor at 1000 C for 3 hours in atmospheric pressure . Ammonia and B2O3 was generated from the dimerization of urea and dehydration of boric acid, respectively. BN structure was understood by XRD and SEM analysis.

Keywords: BN, CVD, Thermodynamics, XRD, SEM

Complex Of 3a,6a-Diaza-1,4-Diphosphapentalene with Lewis Acids – Thermal Investigation

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3a,6a-Diaza-1,4-diphosphapentalene, as a neutral ligand displays a new type of complexation, such that the lone pair at the phosphorus atom is not involved in the coordination; instead, the 10π-electron system provides two electrons for the coordination bond formation between the phosphorus atom and the metal. The p(π)-type complexes – molecular adducts of 3a,6a-diaza-1,4-diphosphapentalene with $GeCl_2$, $SnCl_2$, and InI_3 were synthesized and completely characterized.

In the crystal, molecules of this complexes form coordination polymers stabilized by numerous short contacts (Fig.1).

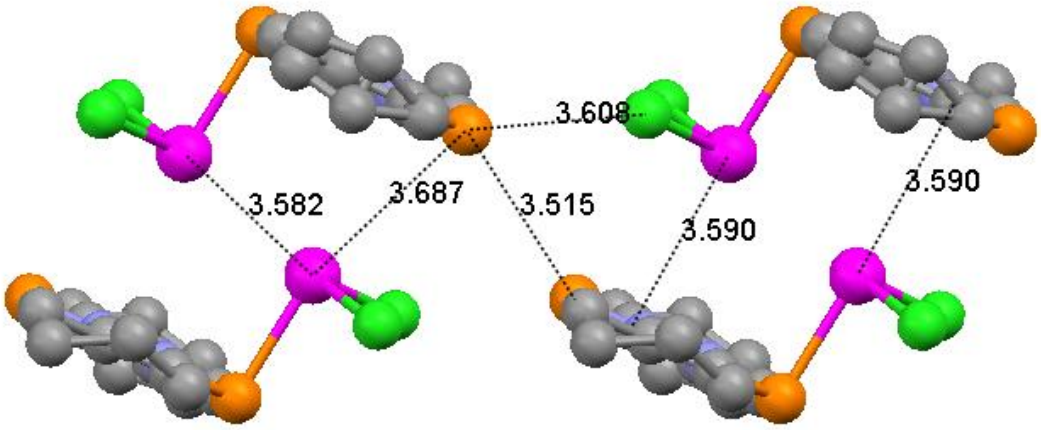

Fig. 1. Crystal structure of 3a,6a-diaza-1,4-diphosphapentalene with germanium dichloride. The hydrogen atoms are omitted.

We carried out thermal research of these complexes by differential scanning calorimetry and determine their thermal stability.

Keywords: 3a.6a-Diaza-1.4-Diphosphapentalene, Differential Scanning Calorimetry, Thermal Stability

Acknowledgement

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Thermal Decomposition of Pb (H_2O) (C_4O_4)

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The TDXD plot shows that the dehydration of the precursor proceeds in two stages. At the lowest temperatures (20-40 °C), powder patterns agree with the presence of $Pb(H_2O)(C_4O_4)$ together with a small amount of the tetrahydrate precursor. A further *ex situ* experiment revealed that $Pb(H_2O)_4(C_4O_4)$ slowly dehydrates into the monohydrated phase after being milled for homogeneity, which explains the presence of both compounds at room temperature in the TDXD plot. This is confirmed by the TG analysis performed with a milled powder, which demonstrates that the tetrahydrate precursor does not longer exist at the beginning of the experiment. Both TG curve and TDXD plot show that $Pb(H_2O)(C_4O_4)$ dehydrates at 110 °C (weight loss: exp. 5.5 %; theor. 5.3 %). Powder patterns of a compound with the given formula PbC_4O_4 are thus observed between 120 and 285 °C.

Further heating of PbC_4O_4 above 285 °C leads to the decomposition of the squarate group into successive lead oxides. The first badly crystallised phase (285-305 °C) observed on the TDXD plot could not be clearly identified, but comparison of its powder pattern to these of lead-containing carbonates suggests that Pb_2OCO_3 (ICDD PDF 00-48-1888) is formed before the apparition of α-PbO (litharge, ICDD PDF 03-65-0400), observed in the short temperature range of 305-330 °C (weight loss: exp. 35.1 %; theor. 34.8 %). This last phase is not stable at this temperature and oxidises rapidly into Pb_2O_3 (ICDD PDF 01-76-1832), observed between 330 °C and 460 °C. It is consistent with the slow increase of the sample mass seen on the TG curve carried out under airflow (weight loss: exp. 33.3 %; theor. 31.9 %). Amount of Pb_2O_3 and also a small quantity of PbO leads to the formation of Pb_3O_4 seen on the TDXD plot in the range 460-575 °C (weight loss: exp. 34.3 %; theor. 32.8 %). Finally, α-PbO is formed again at 575 °C. Such oxidation-reduction mechanism of α-PbO has been well described, in particular after decomposition of lead carboxylates.

Keywords: TG Curve, The TDXD Plot, Dehydration, Precursor

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Effect of B Element Ratio on Thermal Properties of $Nimn_{40}fe_5sb_{10-X}b_x$ Alloys

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We have studied thermal properties of polycrystalline $NiMn_{40}Fe_5Sb_{10-x}B_x$ alloys (atomic percentage) for x=0, 1, 2, 3, 4. Polycrystalline $NiMn_{40}Fe_5Sb_{10-x}B_x$ alloys were prepared by arc melting method by using metals powder with high purity in pure argon atmosphere. The alloys in the form of ingots were melted several times to ensure homogenization and then they were annealed at 800 ^oC for 20 hours.

Microstructural characterization of the samples was investigated by using scanning electron microscope and X-ray diffractometer. The atomic percent of $Ni_{45}Mn_{40}Fe_5Sb_{10}$ alloy was found as $Ni_{47,30}Mn_{38,83}Fe_{4,19}Sb_{9,69}$ by energy dispersive X-ray spectroscopy (EDX)

Martensite-austenite transition temperature of alloys were determined by differential scanning calorimetry with 10, 15, 20 and 25 ^oC/min heating-cooling rates in argon atmosphere. Activation energies of austenite transition for $NiMn_{40}Fe_5Sb_{10}$, $NiMn_{40}Fe_5Sb_{10}B_1$, $NiMn_{40}Fe_5Sb_{10}B_2$, $NiMn_{40}Fe_5Sb_{10}B_3$ and $NiMn_{40}Fe_5Sb_{10}B_4$ alloys were found as 451 kJ/mol, 413 kJ/mol 438 kJ/mol, 344 kJ/mol, 391 kJ/mol, respectively. As the ratio of boron was increased, the martensite-austenite transition temperatures (T_A) of the alloys increased, except $NiMn_{40}Fe_5Sb_{10}B_4$ alloy.

Keywords: Transformation Temperature, Activation Energy, Boron, NiMnFeSbB

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Thermal Stability of Food Grade W/O Emulsions

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Thermal stability of emulsion is an important parameter for determining the shelf life of food grade w/o emulsions, since temperature driven phase separation may occur during storage.

In this study, w/o emulsions consisting refined olive oil as oil (continuous) phase and maltodextrin (MD), whey protein isolate (WPI) or maltodextrin+ whey protein isolate (MD+WPI) solutions as a water (dispersed) phase were produced. Freezing-melting profiles of these emulsions together with the droplet diameter were determined and the effects of dispersed phase on the thermal stability of emulsions were discussed. Heat flow was recorded between 20°C to -60°C to and -60°C to 20°C by using differential scanning calorimetry (DSC) with a 2.5 °C/min scanning rate. Initial stability of the emulsions was determined according to droplet diameter measurement by using dynamic light scattering particle analyser, and average sauter mean diameter ($d_{3,2}$) of w/o emulsion was calculated.

Freezing and melting peak temperature of olive oil were found -40.14 and -4.01°C, however one minor and one major endothermic peak were observed. For the emulsions, freezing and melting peak temperatures were found between -38.14/-38.78°C and 0.27/0.64°C respectively. Incorporation of water into oil droplets significantly increased the freezing and melting enthalpy irrespective of dispersed phase; however characteristic two endothermic peaks of olive oil were preserved but shifted towards higher temperatures. The lowest sauter mean diameter (the more stable emulsions) was observed in 16% WPI emulsion with 0.423 μm and 16% MD emulsion with 0.574 μm. Although the lowest particle diameter was observed for 16% WPI and 16% MD emulsions, the freezing and melting profiles were not significantly affected from particle size, in case they were found dependent on the olive oil used.

Keywords: w/o Emulsion, Freezing, Melting, Stability

Investigation by a Genetic Algorithm of Fiber-Matrix Interface Damage of Bio-Nanocomposite Sisal/Graphite-Epoxy

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The objective of this work is to predict damage to the interface between the fiber and the matrix of a Bio-nanocomposite material Sisal/Graphite-epoxy (Sisal fibers and graphite epoxy) by a genetic algorithm. This material sharing has an interesting alternative for the environment and the industry with good mechanical properties.

According to the calculation by a genetic algorithm, the results show that the damage level of the interface is related to the nature of the fibers used and to applied mechanical stress. Our simulation showed that the Sisal / Graphite-epoxy is stronger than the Sisal /Epoxy. This result coincides with the experimental study conducted by Antoine et al. So we conclude that natural fibers have an important role in enhancing the strength of bio-nanocomposites.

Keywords: Damage, Interface, Sisal, Genetic Algorithm, Bio-Nanocomposite.

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Improvement of the Mechanical Properties of the Steel 16NC6 by Cementation

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The purpose of this study is to improve the mechanical properties, namely the resistance wear of the 16NC6 steel surface by heat treatment for use as a machine element.

In this paper, we study the dependence of the periods of time for different carburizing temperatures and their effects on the appearing hardness. The treated samples were carefully polished mechanically and their Brinell hardness was measured. As for the cyclic indentation tests performed on the samples, each print of the indenter was amplified and measured; and microscopic examinations of the samples were observed.

Keywords: Carburizing, Hardness, Cyclical Shocks, Microscopy

Study of the Silver and Copper Nanoparticles Diffusion in The Soda Lime Glass

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Glasses doped with metallic nanoparticles have attracted much attention because of their magnetic and optical properties, so, an introducing metallic nanocluster such as silver or copper into glass has long been used for coloring glasses and recently fabricating optical devices. The great interest on these materials is motivated by their high ionic conductivity enabling their potential use as solid electrolytes employed as fuel cell and in electrochemical devices.

In this work, an ion exchange process without using molten salts has been used as a method for coloring the glass. In this process of coloration, a mixture of metallic particles with kaolin and Arabic adhesive is applied on the soda lime glass surface. Afterwards, the painted glass was heat treated to obtain the color. A comparative study was carried out to study the diffusion of metallic nanoparticles (silver and copper) in soda lime glasses depending on several parameters such as: concentration and composition of stain spread on glass, heat treatment temperature. Characterization of the composition and structure of doped glasses is performed by UV-Visible Spectroscopy, nano indentation and scratch device, and the SEM; where the EDX technique was used to determine the penetration of metallic nanoparticles into glass. The obtained result shows that the coloration of painted glass differs and, depends on the concentration and the kind of the mixture. Moreover, it was found that the effect of the heat treatment temperature is primordial on the formation and diffusion of metallic nanoparticles.

Keywords: Copper Nanoparticles, Silver Nanoparticles, Ion Exchange, Soda Lime Glass, Spectroscopy

The Usage of Vibratory Stress Relief Method in Welding

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The residual stresses occur in the part after welding, as a result of the thermal expansions and the metallurgical transformation. Depending on the amplitude and distribution in the material, occurred residual stresses cause distortion in welded work piece or a crack in the welding zone. Therefore, a thermal treatment is usually carried out to decrease the residual stresses after the welding process. But nowadays, non-thermal stress relief methods are preferred due to some disadvantages of thermal stress relief methods (heat treatments) such as negative effects on the material and the difficulty in the application for large scale work pieces. In this study, reduction of the residual stresses which occur after welding and cause to decrease in the life cycle of materials, by using a non-thermal method called "vibratory stress relief" and the application of this method to welded parts are investigated.

Keywords: Vibration, Stress Relief, Resonant Frequency, Residual Stress

In vitro Bioactivity Assessment Polymer and Nanohydroxyapatite (nHAp) Nanofibers for Tissue Engineering by Electrospinning Technique

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Nanotechnology is the science of manipulating and rearranging atoms and molecules to create more useful materials, devices, and systems. This technology gives these materials more sufficient properties so that they can be used in many different ways.

Electrospinning technique is one of the effective method to produce nano sized fibers in nanotechnology world. Electrospun fibers can easily mimic the extracellular matrix (ECM) due to its high surface area to volume ratio and these structures have assumed great usage in biomedical applications in recent years.

Damaged tissues and organs are often repaired by artificial substitutes, and nanotechnology offers new opportunities with its various advantages. Many innovative nanomaterials are being evaluated as biomaterials for many utilization areas through their high biocompatibility and biodegradability.

Synthetic fibers which are produced using electrospinning, are widely used for several damaged tissues. In the recent years, nano hydroxyapatite ceramics and some biocompatible polymers have been widely used and regarded as a promising choice of material in tissue engineering field. In this study, a biocompatible polymer and nanohydroxyapatite nanofibers were produced with electrospinning technique and their tissue regenerative behaviors were examined with mesenchymal stem cell**s.**

Keywords: Electrospinning, Nanofiber, Hydroxyapatite, Tissue Engineering

Theoretical Investigation on Vibrational Spectra, Conformational Analysis, Molecular Structure And NBO Analysis of 5-[3-(Trifluoromethyl)Phenyl]Furfural

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Furfural is an important renewable, non-petroleum based, chemical feedstock. Hydrogenation of furfural provides furfuryl alcohol (FA), which is a useful chemical intermediate and which may be further hydrogenated to tetrahydrofurfuryl alcohol (THFA). THFA is used as a nonhazardous solvent in agricultural formulations and as an adjuvant to help herbicides penetrate the leaf structure. Furfural is used to make other furan chemicals, such as furoic acid, via oxidation,[1] and furan itself via palladium catalyzed vapor phase decarbonylation. Furfural is also an important chemical solvent [2].

The FT-IR spectrum of 4 5-[3-(Trifluoromethyl)phenyl]furfural molecule is recorded in the region 4000–400 cm−1 on Vertex 80 spectrophotometer. The FT-Raman spectrum of the title molecule has been recorded using 1064 nm line of Nd: YAG laser as excitation wavelength in the region 50-3500 cm-1 on the Thermo scientific DXR Raman Microscope. The 1H and 13C NMR spectra are taken in solutions and all signals are referenced to TMS on a Bruker Ultrashield FT-NMR Spectrometer. All NMR spectra are measured at room temperature.

There is no complete vibrational and conformational analysis data on 7H4TFC molecule in the literature. Herein, we report the exhaustive conformational search of the 7H4TFC has been performed by molecular mechanic calculations. Geometry parameters and vibrational frequencies of the title compound have been calculated by B3LYP method using 6-311++G(d,p), cc-pVDZ and cc-pVTZ basis sets. The calculated geometric parameters, NMR Chemical shifts and vibrational frequencies were analyzed and compared with obtained experimental results. The calculations were performed at DFT levels by using Gaussian 09 program package, invoking gradient geometry optimization [3-4]. In order to establish the stable possible conformations, the conformational space of the title molecule molecule was scanned with theoretical methods. The optimized structural parameters were used in the vibrational frequency calculations at the DFT level to characterize all stationary points as minima. Then, vibrationally averaged nuclear positions of the title molecule molecule were used for harmonic vibrational frequency calculations resulting in IR and Raman frequencies. In the present work, the vibrational modes were assigned on the basis of TED analysis for 6-311++G(d,p) basis set, using SQM program [5].

Keywords: Furfural derivative, DFT, FT-IR, FT-Raman

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Molecular Structure, Vibrational Spectral Investigation and the Confirmation Analysis of Methyl-6-Quinoxalinecarboxylate

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Literature reveals that to the best of our knowledge DFT calculations and experimental studies on molecular structure and vibrational spectra of Methyl-6-quinoxalinecarboxylate (M6QC) molecule have not been reported so far. Therefore, we have carried out detailed theoretical and experimental investigations on the molecular structure and vibrational spectra of M6QC molecule completely. We have utilized the B3LYP with 6-311++G(d,p), cc-pVDZ , cc-pVQZ and cc-pVTZ basis sets.

The FT-IR spectrum of M6QC molecule is recorded in the region 4000–400 cm^{-1} on Vertex 80 spectrophotometer. The FT-Raman spectrum of M6QC molecule has been recorded using 1064 nm line of Nd: YAG laser as excitation wavelength in the region 50-3500 cm^{-1} on the Thermo scientific DXR Raman Microscope. The ^{1}H and ^{13}C NMR spectra are taken in solutions and all signals are referenced to TMS on a Bruker Ultrashield FT-NMR Spectrometer. The calculations were performed at DFT levels by using Gaussian 09 program package, invoking gradient geometry optimization. In order to establish the stable possible conformations, the conformational space of M6QC molecule was scanned with theoretical methods. Vibrationally averaged nuclear positions of M6QC molecule were used for harmonic vibrational frequency calculations resulting in IR and Raman frequencies.

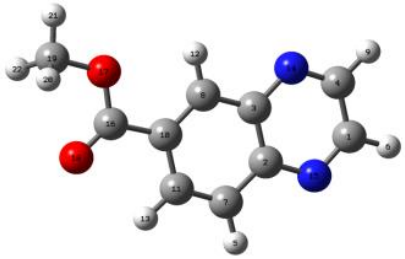

Fig.1 Conformers of the M6QC molecule

Keyword: Methyl-6-quinoxalinecarboxylate**,** DFT, FT-IR, FT-Raman, NMR Spectra

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Temperature Dependence of Metal Oxide Based Gas Sensing Properties Thin Films Grown by Silar Method

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Metal oxide materials are the main source of gas sensor applications. The investigations on metal oxide revolve around studying their properties and methods of increasing the sensitivity and selectivity towards specific gases at different conditions. The role of nanostructure, grain size and operating

temperature is very important for gas sensing application. Successive Ionic Layer Adsorption and Reaction (SILAR) method is one of the methods to deposit nanostructure thin film for gas sensors. The SILAR method is low cost, simple and suitable for large area deposition. Thin films can be used since the deposition is carried out at or near to room temperature. In this study, ZnO and CuO thin films are grown by SILAR method and investigated their NO gas sensing studies. It can be clearly seen that both sample showed acceptable responses to NO gas at very low operating temperatures compared to the other studies. The results demonstrate that metal oxide samples grown by SILAR method can be used in the production of gas sensing materials offering low cost and power consumption.

Keywords: Gas Sensors, Metal Oxide Semiconductors, SILAR

Acknowledgement

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Nh_3 Sensing Properties of Zno Thin Film Grown By Silar Method

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Ammonia (NH_3), toxic gas, is main natural source is from agricultural industries and metabolic processes. The lower limit to human NH_3 perception by smell is calculated around 25 ppm. However, even below this limit, NH_3 is irritating to the respiratory system, skin and eyes. For that reason its detection at low concentrations is crucial in various fields including chemical industries, medical diagnosis, or fertilizer factories. Exposuring to higher concentrations at 1000 ppm or more can cause pulmonary oedema and accumulate fluid in the lungs. For this reason, gas sensors have important role and there are various techniques for growing them.

In this present work, ZnO thin film is grown by SILAR method. The film thickness is controlled by method cycles. The prepared sample was characterized by various techniques. The structural characterization was performed by X-ray diffractometer (XRD) and Scanning Electron Microscope (SEM). Ammonia sensing characteristics of distinct thickness ZnO thin film for 15 cycles is investigated for a wide range of temperature (25 °C to 77 °C) and concentrations (5 – 100 ppm). The maximum response was obtained at 77 °C for 100 ppm NH_3.

Keywords: Gas Sensors, Metal Oxide Semiconductor, Ammonia

Acknowledgement

This work is supported by The Scientific and Technological Research Council of Turkey (TUBİTAK) under Project No, 115M658 and Gazi University Scientific Research Fund under project no 05/2015-09.

Energy and Exergy Analysis in Biogas Production

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In a wastewater treatment plant having an anaerobic digestion section, is important to utilize energy available in digestion for energy saving. In this study, a thermodynamic analysis and assessment of an actual wastewater treatment plant (WWTP) and power production from biogas was performed and results were discussed. It has been found that total exergy destruction of the biogas fueled power generation system (BFPG) is reported as 2300.5 kW which corresponds 73.2 % of the total biogas exergy input to the system. The exergetic efficiency of the system was found as 98% which is sufficient for exergetic performance.

Keywords: Wastewater Treatment, Biogas, Combine Heat and Power, Energy, Exergy

Exergetic and Energetic Performance Analysis of Ohmic Heating of Pineapple Juice

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The alternative technologies have gained importance both from industry and consumer aspects all over the world in order to prevent mainly the inefficient energy usage in the industry and other problems raised such as inadequate energy sources and environmental troubles. Ohmic heating is one of the alternative minimal processing methods in food technology. It is based on the passage of electrical current through a product that serves as an electrical resistance. This study deals with the performance evaluation of ohmic heating process by applying exergy and exergy analysis. The fresh squeezed pineapple juice having total dry matter content of 12.3% was ohmically heated from 10 °C to 80 °C at three different voltage gradients (10, 15 and 20 V/cm). The energy efficiencies for ohmic heating process applied at the 10, 15 and 20 V/cm voltage gradients were %49.09 ± 1.78, %66.06 ± 0.73 and % 72.38 ± 4 while the exergy efficiencies were 48.72 %± 1.95, %65.74 ± 0.78 and 72.19% ± 3.81, respectively. As the voltage gradient increased, the heat generation increased and the heating time decreased. On the other hand, the energy loss was lowest for heating process applied at the voltage gradient of 20 V/cm. Thus, the highest exergy and energy efficiencies for the ohmic heating of pineapple juice were determined for highest voltage gradient (20 V/cm). It was determined that the present system should be improved energetically especially for fruit juices heated at low voltage gradients.

Keywords: Ohmic, Energy, Exergy, Heating, Pineapple Juice

Rheological Behavior of Acrylic Coating Deposited on Sandblasted Soda Lime Glass

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In Saharan regions, the environmental impacts generated by sand storms, lead to a surface damage of a large number of brittle materials such as windscreens of vehicles, protective glass sheets of solar panels, various glazing. In the case of glass sheets, this damage is provoked by the formation of microscopic defects generated by sand impacts. Different efforts have been attempted to correct such defects, but they remain insufficient. In the present work, erosion tests are carried out using different sand masses (50 - 200 g) to obtain different surface states. The sand flux velocity and impact angle are kept constant (25 m/s and 90°, respectively). By increasing the projected sand mass, the damage of the surface increases. After projecting 200 g of sand, it clearly appears that the arithmetic roughness increases up to 1.99 µm and the optical transmission falls from 91.4% (initial value) to 20%. After that, acrylic coatings are deposited on sandblasted samples, to fill the troughs of the microscopic surface defects. The deposited layer has permitted to improve the surface state by decreasing clearly the roughness and by increasing the transmission values (≈ 89%). Mechanical properties and rheological behavior of the acrylic coating have been assessed using micro-indentation technique. A four-element viscoelastic model was used to fit the indentation depth evolution during micro-indentation creep experiments. Results show that the acrylic coating exhibits a viscoelastic behavior. The hardness Hv of the deposited coating and Young's modulus are found respectively equal to 1.6 GPa, and 55.5 GPa.

Key words: Glass, Erosion, Optical Transmission, Roughness, Indentation Test

Synthesis, Structural Study of Diffraction of Compound RX Pb (C2O4)

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The structure of new oxalate Pb (C2 O4) was solved starting from the data of the diffraction o Was solved starting from the data of the diffraction of X-rays by the powder. This crystallize compound in the monoclinical system with the figures of merits M (20) = 14.2 and F (20) = 19.4 (0.0169; 91). The cell parameters are: a=15.6361 (6) Å, b=5.5858 (2) Å, c=9.1739 (3) Å, □ =96.184(3) and V=796.59 Å3.

Keywords: Oxalate, Diffraction of X-rays, Powder, Crystallize Compound, Monoclinical System

Novel Perfluorinated Aminothiols as a Perspective Oil Additives and Ligands

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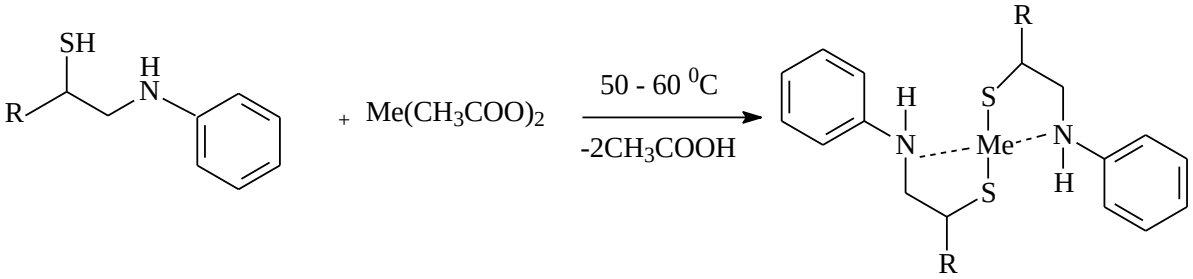
Organofluorine compounds find diverse applications in many branches of industry owing to their unique properties such as high surface activity, thermal and acid resistance, and water and oil repellency, and also as pharmaceuticals, refrigerants and reagents in catalysis [1-3].

Continuing investigations in this field we have synthesized new alkyl-substituted and fluorinated 1,2-aminothiols through interaction of some thiiranes with aniline [4]. Although metal thiolates have been known since the beginning of co-ordination chemistry an attracting interest in the study of these species comes from their biological importance and the numerous potential applications, and also from structural point of view. Therefore by the interaction of fluorinated 1,2-aminothiols with Fe, Co, Ni, Cu acetates new complexes of the title compounds have been obtained:



$R = C_2F_5CH_2O$; Me = Fe, Co, Ni, Cu

The reaction was carried out in absolute ethanol medium during 2-3 hours at 50-60°C. The yield of products was about 79-87%. The metal complexes were precipitated as solvated colored crystals. Structure of the synthesized ligands have been confirmed by IR, 1H, 13C NMR spectroscopy analysis; purity - by elemental analysis and thin-layer chromatography. Synthesized compounds have been investigated as antimicrobial, antioxidant, antiwear additives for lubricant oils. It has been determined that some of them exceed in quality in comparison with some industrial additives.

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Precipitation and Dissolution Kinetics of GP Zone and Metastable Phase in Al-Cu alloys

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The kinetic parameters such as activation energy, E, and the growth morphology parameters n and m were determined by a non-isothermal method. The microstructure variations of the precipitation and

dissolution of GP zone and metastable phase ϴ′ in Al-3wt. % Cu were analysed by optical microscopy (OM) and X-ray diffraction (XRD). The kinetics of GP zone and metastable phase ϴ′ in Al-3wt. % Cu was investigated using differential thermal analysis (DTA) were carried out between room temperature and 430°C at heating rates of 20, 25 and 30°C min^{-1}. The activation energies of GP zone precipitation, formation of ϴ′/ϴ and dissolution of ϴ′ were 26, 105 and 77 $KJ.mol^{-1}$ respectively. The growth morphology parameters n (Avrami parameter which indicates the crystallization mode) and m (a numerical factor which depends on the dimensionality of crystal growth) are both about 1.5.

Keywords: Differential Thermal Analysis, Precipitation, Activation Energies

Nano Abrasive Grains Use in Optical Glass Chemical Mechanical Polishing

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The precision is the goal sought by all researchers and industrialists in all areas. In effect, the smallest values are always chased in the purpose of producing the quasi-perfect. This precision is even more accentuate in the optical filed, where desired surfaces quality is in nanometer and Angstrom roughness and shape accuracy. This condition cannot be reached easily. Indeed, some precise optical polishing process are often used. Chemical mechanical polishing process (CMP) is one of them where nanometric abrasive grains can be useful to obtain very smooth surfaces.

This study aims to show surface improvement using nanometric abrasive grains for the optical glass polishing. Additionally, the influence of the abrasive grains wear used in CMP was evaluated. For this purpose, the morphology, the granulometric distribution, the chemical composition and the agglomeration phenomenon…etc., were investigated and the efficiency and performed quality are measured. The microscopy and materials characterization technics were very useful to achieve this investigation.

Keywords: Nano-abrasive, Wear, Polishing, CMP, Optical Glass

Mechanism and Kinetic Parameters of Al–Si Spinel Crystallization from Algerian Tamazarte Kaolinite by Differential Thermal Analysis

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In this study, the mechanism and kinetic parameters of Al–Si spinel crystallization from Algerian Tamazarte kaolinite was studied by Differential thermal analysis (DTA) technique under non-isothermal conditions, which were carried out on samples between room temperature and 1400°C at different heating rates (10-40°C min^{-1}). X-ray diffraction was used to identify phases present in the samples. The activation energies measured by DTA from isothermal and non-isothermal treatments using Johnson–Mehl–Avrami (JMA) theory and Kissinger methods were around 820 and 870 kJ/mol, respectively. The growth morphology parameters n (Avrami parameter which indicates the crystallization mode) were found to be almost equal to 1.07, using non-isothermal treatments, and equal to 1.1 using isothermal treatments. and m (a numerical factor which depends on the dimensionality of crystal growth) was 0.95 obtained by Matusita et al. equation. Analysis of the results showed that bulk nucleation was dominant in Al–Si spinel crystallization followed by Two-

dimensional growth of mullite crystals with plates morphology controlled by diffusion from a constant number of nuclei.

Keywords: Al–Si Spinel, Avrami Parameter, Differential Thermal Analysis, Activation Energy

Thermal, Rheological and Morphological Properties of Biodegradable Blends Based on Poly (Lactic Acid) and Polycarbonate Blends

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Biopolymers are expected to be an alternative for conventional plastics due to the limited resources and soaring petroleum price which will restrict the use of petroleum based plastics in the near future. In this context, poly(lactic acid) (PLA) has attracted the attention of polymer scientists as a potential biopolymer to substitute the fossil fuel based polymers.

Even the huge advancements in PLA research, there is still many drawbacks that continue to limit its employment in some sectors which require particular mechanical and thermal properties. For this reason, blending with other polymers appears as an attractive strategy to overcome the PLA's shortcomings and enlarge its application domains. Among possible PLAblends, its combination with polycarbonate (PC) presenting a high inherent thermal stability and an important tensile strength appears the more suitablepath to overcome PLA brittleness and poor thermal resistance. Consequently, PLA/PC blends have received considerable attention in research because of their potential applications as friendly to the environment advanced packaging materials and for industrial applications.

The objective of this study was to prepare biodegradable materials based on a bio-based polymer, which is the PLA and an engineering thermoplastic, PC. The properties of the blendswere characterized by differential scanning calorimetry (DSC), thermogravimetric analysis (TGA)and scanning electron microscopy (SEM).The study showed that the blendskneading torque are between those of the homopolymers and are proportional to the rate of PLA. Thermogravimetric analysis showed that PC improved notably the thermal stability of the blends. DSC results pointed out significant changes on the thermal behavior of the PLA phase into the blends.

Keywords: Blends, Biopolymer, Poly (Lactic Acid), Polycarbonate, Thermal Stability

Kinetics Parameters of the Thermal Dehydroxylation of Gibbsite $Al(OH)_3$ by Differential Thermal Analysis (DTA)

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In this present study, the thermal decomposition of gibbsite Al(OH)3 was studied by Differential Thermal Analysis (DTA) technique under non-isothermal conditions, the gibbsite powder were carried out between room temperature to1100Kusing heating rates of 5, 10, 15 and 20°C min-1.Theobtained DTA curves show three different peaks: the first peak is due to the partial dehydroxylation of gibbsite, the value of the activation energy (EA) correspond to 143KJ/mol.The second peak correspond to decomposition of gibbsite to boehmite, the activation energy(EA)were found around to 185kJ mol−1. The third peak is due to the transformation of boehmite to alumina. The values of (EA)were also found

to be175kJ mol−1.The values of apparent activation were determined by Ozawa–Flynn–Wall (OFW), Boswell and Kissinger–Akahira–Sunose (KAS) methods and by using the 32 types of non-isothermal kinetics differential equation. The phases formed and structural changes were investigated by differential thermogravimetry (DTG) and X-ray diffraction (XRD), for gibbsite powder treated at different temperatures from room temperature to 1100°C.

Keywords: Gibbsite, Differential Thermal Analysis (DTA), Decomposition Kinetics, Activation Energy

Density Measurements of N.Butanol+ N.Hexane in the Temperature Range from 290 K to 560 K at Pressures up to 60 MPa

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Density is one of the main physico-chemical characteristics of substances. Therefore its studing is very important for technological processes calculations and for modernization of solutions theories.

For experimental investigation the hydrostatic weighting method has been chosen modified variant of the experimental installation has been assembled. The investigation has been held by the method in the temperature interval 290-500 K and pressure 0.1- 60 MPa at mass concentration. The measurement has been carried out with a maximum error of 0.08 % in the whole state parameter region under study.

A detailed analysis of the concentration dependence of *p-V-T* data of all the systems studied has shown, that the concentration dependence of the density deviates from the additive it line and changes with temperature and pressure.

The analysis of the given experimental shows that for all the substances investigated the equation of state proposed by Naziyev and Hasanov is suitable:

$$\rho^4 = A + B \cdot p^{0.5} + C \cdot p \qquad (1)$$

where p is the pressure, MPa; ρ is the density of substance, g/cm3; A, B, C are the temperature (T, K) dependent coefficients. The A, B, C coefficients are calculated for each isotherm by the least squares method and are described analytically as

$$A = \sum_{i=0}^{5} a_i T^i \ , \ B = \sum_{i=0}^{6} b_i T^i \ , \ C = \sum_{i-0}^{6} c_i T^i \qquad (2)$$

The equation (1) with account of (2) describes all the experimental data with an average error of 0.05-0.1%. The coefficients *a*i, *b*i and *c*i have the concentration dependences.

The generalization of the experimental data is of great interest in vien of information storage in the form of equation and prediction of properties of the object investigated. The proposed method of a comparative calculation attention of investigators by its simplicity and universality. This method allows to predict the properties of the third solution with the help of the two ones and also to extrapolate the properties of the system.

Keywords: Density, N.Butanol, N.Hexane

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