

Table of Contents

Committees and Sponsors

Preface

Keynote

I.

Overview of Current International Magnesium Research and Recent CAST CRC Developments

D.H. StJohn

3

Advanced Wood- and Bio-Composites: Enhanced Performance and Sustainability

J.E. Winandy

9

New Ceramic Membrane Materials for Gas Purification

I.W.M. Brown, M.E. Bowden, T. Kemmitt, A. Kirchner and K. MacKenzie

15

A Ductile UFG Al Alloy via Cryomilling and Quasi-Isostatic Forging

A.P. Newbery, B. Ahn, P. Pao, S.R. Nutt and E.J. Lavernia

21

Metals

II.

Compaction of Ti-6Al-4V Powder by ECAE with Back-Pressure

R. Lapovok, D. Tomus and B.C. Muddle

33

Optimising the Model of Gas-Jet Quenching of a Carburised Gear

P. Stratton

37

Metallurgical Nature at the Interface between Tool Shoulder and Workpiece during Friction Stir Welding

Z.W. Chen, T. Pasang, Q. Yin and R. Peris

43

Multifarious Fracture Features of CuZrAlGd(Ag) Bulk Metallic Glasses

H.M. Fu, H. Zhang, H. Wang, M.X. Zhang and Z.Q. Hu

47

Biomechanical and Biocorrosion Properties of Nanostructured Titanium

X.N. Zhang

51

Characterization of Indentation Size Effect of Hardness Using a Loading Curve from Crystalline Materials

Y.L. Chiu and W.G. Ferguson

55

The Effect of Additives and Substrate Conditions on the Copper Electrodeposition for Thin Film Applications

T.G. Woo, K.W. Seol, I.S. Park, H.W. Lee, K.N. Woo and W.Y. Jeon

59

Surface Characteristics of the Anodized and Hydrothermally Treated Titanium Affected by the Current Density, Voltage, and Time

I.S. Park, T.G. Woo, M.H. Lee, T.S. Bae and K.W. Seol

63

Surface Characterization of an Extruded 6060 Al Alloy

W. Zhang, J. Metson, C.L. Nguyen and S. Chen

67

Mechanical Properties of Directionally Arrayed Dendrites in the Ni₃Al Matrix Alloy

Y. Lu, J.H. Lee, Y.H. Jang, S.S. Kim, M.H. Oh and D.M. Wee

71

Mechanical Properties of Micro-Porous Metals Produced by Space-Holding Sintering

T. Banno, Y.C. Li, C.E. Wen and Y. Yamada

75

Growth and Properties of Stannite-Quaternary Cu₂ZnSnSe₄ Thin Films Prepared by Selenization of Sputtered Binary Compound Precursors

R.A. Wibowo, W.S. Kim, B. Munir and K.H. Kim

79

Fabrication of High Mg Containing Al-Mg Alloy Sheets by Twin Roll Strip Casting

H.W. Kim, C.Y. Lim and S.B. Kang

83

Warm Hydroformability and Mechanical Properties of Pre- and Post- Heat Treated Al6061 Tubes

H.K. Yi, J.H. Lee, Y.S. Lee and Y.H. Moon

87

Synthesis and Characterization of Nitrogen Implanted Titanium Alloys

B.Y. Choi, J.K. Jeong and Y.B. Lim

91

Control of Degradation of Biocompatible Magnesium in a Pseudo-Physiological Environment by a Ceramic Like Anodized Coating G.L. Song	95
Sonoelectroplating of Sn - Bi Solder Film from EDTA Bath A. Chiba, T. Kojima and W.C. Wu	99
Microstructure of Rapidly Solidified Ti-46Al-2Cr-2Nb-xY Alloys Y.Y. Chen, Z.G. Liu, L. Chai, F.T. Kong and H.A. Davies	103
Studies on Porous Titanium Alloy Implant Manufactured by Three Dimensional Solid Freeform Fabrication System K.K. Lim, P. Cheang and M. Chandrasekaran	107
Influence of Reaction Temperature for the Manufacturing of Al-3Ti and Al-3B Master Alloys and their Grain Refining Efficiency on a Al-7Si Alloy S.A. Kori and V. Auradi	111
Enhancing Fatigue Properties of Nanostructured Metals and Alloys T.C. Lowe	117
Microstructural Modification of Metallic Materials by Electromagnetic Processing and the Theoretical Interpretation L. Zuo, Y.D. Zhang, Z.C. Hu, H.I. Faraoun, X. Zhao and C. Esling	123
Approaches to the Design and Processing of Novel Titanium Alloys C.J. Bettles, R. Lapovok, H.P. Ng, D. Tomus and B.C. Muddle	127
Microstructure and Morphology of Alumina-Iron Nanocomposite Powders Produced by High Energy Mechanical Milling M. Yusop, D.L. Zhang and M. Wilson	131
Characterisation of Ti(Al₂O₃)-Al₂O₃ Composite Powders and Thermally Sprayed Coatings A. Salman, B. Gabbitas, D.L. Zhang, P. Cao and S. Raynova	135
Ultrafine Grained Ti-47Al-2Cr (at%) Alloy Prepared by High Energy Mechanical Milling and Hot Isostatic Pressing V. Nadakuduru, P. Cao, D.L. Zhang and B. Gabbitas	139
Effect of Composition on the Morphology and Hardness of Nanostructured Cu Based Composite and Alloy Powders/Granules Produced by High Energy Mechanical Milling A. Mukhtar, D.L. Zhang, C. Kong and P.R. Munroe	143
A Novel Process for Lowering the Cost of Titanium G. Adam, D.L. Zhang, J. Liang and I. Macrae	147
Effect of Carbon Addition on the Microstructure and Properties of M3:2 High Speed Steels Processed by Powder Metallurgy R. Zhou, D. Wang, J. Shen and J. Sun	153
Consolidation of TiAl Powder by Thermal Spray Processes P. Cao, B. Gabbitas, A. Salman, D.L. Zhang and Z.H. Han	159

Polymers

	III.
Syntactic Foams Consolidated with Starch: Modelling for Pre-Mould Processing M.M. Islam and H.S. Kim	165
Syntactic Foams Consolidated with Starch: Mixing Behaviour for Post-Mould Processing M.M. Islam and H.S. Kim	169
Chemical Imaging of the Spatial Distribution and Interactions of Tannin Dispersal in Bioplastic Systems M. Gaugler, W. Grigsby, D. Harper and T. Rials	173
New Strategy toward Novel Hyperbranched Phenol-Formaldehyde Resin: Synthesis, Characterization and Curing Study S. Ghosh	177
The Use of Aqueous Urea as Chemical Denaturant in Processing CGM into a Biodegradable Polymer Material C. Viljoen, C.J. Verbeek and K.L. Pickering	181

Ceramics

IV.

Production of High Purity Alumina and Zeolite from Low-Grade Kaolin M.S. Meor Yusoff, M. Masilana, T.F. Choo and A.M. Julie	187
Control of Shell Thickness in Silica-Coating of AgI Nanoparticles Y. Kobayashi, K. Misawa, M. Takeda, N. Ohuchi, A. Kasuya and M. Konno	191
Triethanolamine Molybdate, a New Polymeric Precursor for Molybdenum Nitride S. Mondal and A.K. Banthia	195
Polycondensation of Urea and Boric Acid to Give Polyborate Ester, a Precursor for Boron Nitride S. Mondal and A.K. Banthia	199
Processing of Mullite Whiskers from Kaolin B.M. Kim, T.Y. Yang, S.Y. Yoon, R. Stevens and H.C. Park	203
Joining of Ceramic Components in the Green State via LPIM R. Waesche, C. Paulick, G. Steinborn, V. Richter and M. Werner	207
Synthesis and Characterisation of Titania Nanotubes: Effect of Phase and Crystallite Size on Nanotube Formation D.L. Morgan, E.R. Waclawik and R.L. Frost	211
Highly c-Axis Oriented Al-Doped ZnO Thin Films Grown in Premixed H₂/Ar Sputtering Gas E.S. Lee, R.A. Wibowo and K.H. Kim	215
Fabrication and Microstructure Evaluation of Oxide and Carbide Ceramic Coatings onto Heterogeneous Substrates by Solid-Vapor Reaction J.H. Kang, Q.H. Bao and Y. Jung	219
Orientation Control in Multilayered Alumina Prepared Using Electrophoretic Deposition in a Strong Magnetic Field T. Suzuki, T. Uchikoshi, K. Morita, K. Hiraga and Y. Sakka	223
Direct Shaping of Alumina Ceramics by Electrophoretic Deposition Using Conductive Polymer-Coated Ceramic Substrates T. Uchikoshi, S. Furumi, T. Suzuki and Y. Sakka	227
Transformation of Bone Origin Hydroxyapatite at Elevated Temperatures and in Selected Atmospheres K. Haberko, M.M. Bućko, W. Mozgawa, A. Pyda, M. Haberko and J. Carpentier	231
High-Frequency Induction Heating Sintering of Ultra-Fine Al₂O₃-(ZrO₂+X%mol Y₂O₃) Bioceramics S.W. Kim, K.A. Khalil and K. Ogi	235

Composites

	V.
Thermal, Mechanical and Morphological Performance of BisGMA/TiO₂ Nanocomposite D. Behera and A.K. Banthia	241
Tensile Deformation and Fracture in a Bulk Nanostructured Al-5083/SiC_p Composite at Elevated Temperatures F. Tang, B.Q. Han, M. Hagiwara and J.M. Schoenung	245
Fabrication of Al-Si-Cu-Mg-Zn Alloy Matrix Composite Reinforced with Submicrometer Sized Al₂O₃ Particles Formed by Displacement Reaction K.D. Woo, I.B. Lee, I.Y. Kim and D.L. Zhang	249
Environmentally Intelligent Biocomposites S. Weal, S. Anderson, R. Anderson, T. Stuthridge and A. Fernyhough	255
Preparation and Characterization of Alumina/TZP Particulate Composites Y.K. Cho, T.Y. Yang, J.M. Lee, S.Y. Yoon and H.C. Park	259
Deformation Behaviour of Composites Reinforced with Four Different Linen Flax Yarn Structures J.E.P. Carpenter, M.H. Miao and P. Brorens	263
Fabrication and Characterization of Polypropylene/Ethylene-Octene Copolymer Blend Nanocomposites S.K. Samal, S. Mohanty and S.K. Nayak	267
Fabrication and Characterization of Sisal/Glass and Polypropylene Hybrid Composites S.K. Samal, S. Mohanty and S.K. Nayak	271

Thermal, Morphological and Dynamic Mechanical Characterization of Melt Blended PC Nanocomposites	
S.K. Samal, S. Mohanty and S.K. Nayak	275
Rheological Characterization of Jute/HDPE Composites	
S. Mohanty and S.K. Nayak	279
The Abrasive Wear of Alumina Matrix Particulate Composites at Different Environments of Work	
Z. Pędzich	283
Improving Hygrothermal Performance in Epoxy-Biofibre Composites	
R.H. Newman, A. Thumm, E.C. Clauss and M.J.L. Guen	287
MWNT Polymer Nanocomposites Based on P3HT	
A.W. Musumeci, G.G. Silva, J.W. Liu, L. Rintoul, E.R. Waclawik and G.A. George	291
Intercalation of Montmorillonite by Interlayer Adsorption and Complex Formation	
M. Pannirselvam, R.K. Gupta, S.N. Bhattacharya and R.A. Shanks	295
On Feasibility of Ply-Layup Orientation in CF/Epoxy Composite Laminates Using Rayleigh Probes	
J.W. Park, K.H. Im, D.K. Hsu, U. Heo, K.S. Lee, Y.H. Kim, S.K. Kim and I.Y. Yang	299
Evaluation of the Mechanical Properties of Injection Moulded Hemp Fibre Reinforced Polypropylene Composites	
G.W. Beckermann, K.L. Pickering and N.J. Foreman	303
Natural Fibre-Reinforced Thermoplastics Processed by Rotational Moulding	
K. Jayaraman, R. Lin, D. Bose and M. Maarouf	307
Numerical Study of Functionally Graded Materials	
K.M. Naryanappa, M. Krishna, S.C. Sharma and H.N.N. Murthy	311
Accelerated Weathering of Modified Wood Flour Plastic Composites	
J.S. Fabiyi and A.G. McDonald	315
Influence of Alkali Treatment on the Interfacial Bond Strength of Industrial Hemp Fibre Reinforced Epoxy Composites: Effect of Variation from the Ideal Stoichiometric Ratio of Epoxy Resin to Curing Agent	
M.S. Islam and K.L. Pickering	319
The Effects of Residual Lignin Content on Wood Fibre Reinforced Polypropylene Composites	
M.D.H. Beg and K.L. Pickering	323
Electrical Spectroscopy Studies of Organic/Inorganic Nano Composites	
A. Anis and A.K. Banthia	327
Improvement of the Red Mud Polymer-Matrix Composites by Organophilization of Red Mud	
A.H. Bhat and A.K. Banthia	333
Hemp Fibre Reinforced Poly(Lactic Acid) Composites	
M.A. Sawpan, K.L. Pickering and A. Fernyhough	337
Natural and Man-Made Cellulose Fiber Reinforced Hybrid Polypropylene Composites: Effect of Fire Retardants	
M.A. Khan, J. Ganster and H.P. Fink	341
Functional Materials	
	VI.
Comparative Study of Copper Diffusion in Plasma Treated Low-k Dielectric Thin Film Using XPS and SIMS	
K.C. Aw, N.T. Salim, W. Gao, Z.W. Li and K. Prince	347
Growth and Evaluation of GaN Grown on Patterned Sapphire Substrates	
D.H. Kang, J.C. Song, D.W. Kim, J.S. Kim, K. Santhakumar and C.R. Lee	351
Characteristics Comparison between GaN Epilayers Grown on Patterned and Unpatterned Sapphire Substrate (0001)	
J.C. Song, D.H. Kang, B.Y. Shim, E.A. Ko, D.W. Kim, K. Santhakumar and C.R. Lee	355
Electrical Properties of Mn-Co-Ni Oxides Prepared at Low Temperatures	
T. Yokoyama, T. Meguro, S. Okazaki, H. Fujikawa, T. Ishikawa, J. Tatami, T. Wakihara, K. Komeya and T. Sasamoto	359

Actuation Behavior of CP Actuator Based on Polypyrrole and PVDF J.M. Ha, H.O. Lim and N.J. Jo	363
A Novel Nano-Water-Purifying Material W. Han, M.X. Lu, H. Wang and G. Liu	367
Characterization of Quasi-Nano Crystalline Ni-Zn Ferrite Powders Prepared by Self-Propagating High Temperature Synthesis Y. Choi	371
Durability and Performance of Indigenous Amorphous Silica in Advanced Cementitious Systems A.G. Langdon, G.H. Moran and W. South	375