

# Table of Contents

## Preface

## Chapter 1: Steel, Alloys and Intermetallic Compounds

|                                                                                                                                                                                                          |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Modelling of Mechanical Properties of Pearlitic Rail Steel</b><br>P. Boonsukachote, S. Kingklang and V. Uthaisangsuk                                                                                  | 3  |
| <b>Effect of Boron Addition and Sintering Atmosphere on Precipitation in Sintered Fe-Mo-C Steels</b><br>N. Tosangthum, P. Kunnam, M. Morakotjinda, W. Koetnityom, R. Krataitong, P. Wila and R. Tongstri | 9  |
| <b>The Quality Improvement of Molten Aluminium Alloy in Melting Process by Stirring Process and the Degassing Technique</b><br>J. Tempiamwatcharothai, K. Sirivedin, P. Mungsantisuk and S. Thuanboon    | 17 |
| <b>Influence of Pre-Stretching Levels on the Forming Limit Strain and Stress Curves of High Strength Steel Sheet</b><br>K. Laokor, B. Chongthairungruang and S. Panich                                   | 25 |
| <b>Application of Ultrasonic Inspection for Microstructure Analysis of Stainless Steel Grade 304L</b><br>K. Sojiphan, P. Wangsupangkul and T. Chailampangsuksakul                                        | 32 |

## Chapter 2: Biomedical Materials

|                                                                                                                                                                                                                                                                  |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Association between Extracellular Matrix Accumulation and Oxidative Stress-Induced Apoptosis in Chondrocytes Cultured on 3D-Porous Scaffolds in Static versus Dynamic Cultures</b><br>T. Lertwimol, P. Sonthithai, W. Kosorn, M. Wongcumchang and W. Janvikul | 41 |
| <b>Shear Bond Strength of Resin Cement to Saliva-Contaminated Metal Alloys after Various Surface Treatments</b><br>A. Surintanasarn and N. Thamrongananskul                                                                                                      | 47 |
| <b>A Study of Sericin-Thunbergia Laurifolia Electrospun Fibre for Wound Healing Applications</b><br>P. White, S. Chooprajong and P. Pankaew                                                                                                                      | 53 |
| <b>Effect of Heat Treatment on Mechanical and Setting Properties of TTCP-Based Calcium Phosphate Cement</b><br>K. Pooput, K. Sedchaicharn, A. Phuchamnong and W. Petcharoen                                                                                      | 59 |
| <b>Tissue Integrated 3D Printed Porous Polyethylene Implant</b><br>J. Suwanprateeb                                                                                                                                                                               | 65 |
| <b><i>In Vitro</i> Resorbability of 3D Printed Hydroxyapatite in Two Different pH Buffered Solutions</b><br>F. Thammarakcharoen, P. Palanuruksa and J. Suwanprateeb                                                                                              | 71 |
| <b>Dual-Curing Polylactide for Resorbable Bone Cement</b><br>S. Channasanon, P. Kaewkong and S. Tanodekaew                                                                                                                                                       | 77 |
| <b>A Comparative Study of Granular Agglomeration between 3D Printed Hydroxyapatite and Commercial Bone Graft Granules</b><br>F. Thammarakcharoen, A. Yampakdee, B. Buranawat and J. Suwanprateeb                                                                 | 83 |

## Chapter 3: Materials for Energy Storage and Sensors

|                                                                                                                                                                                                                                          |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Physical and Electrical Property of TiO<sub>2</sub> Nanotube Arrays for Supercapacitors</b><br>S. Chumphongphan                                                                                                                       | 91 |
| <b>The Interconnected Open-Channel Highly Porous Carbon Material Derived from Pineapple Leaf Fibers as a Sustainable Electrode Material for Electrochemical Energy Storage Devices</b><br>S. Kingsakklang, S. Roddecha and M. Sriariyana | 97 |

|                                                                                                                                                                                       |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Room Temperature Gas Sensor Based on Helical Carbon Coils</b><br>U. Pakdee, P. Phunudom, S. Nantakarat, A. Thaibunnak, P. Roipromma, S. Rungruang, P. Prajansri and G. Chaloeipote | 105 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|

## Chapter 4: Tribology, Surfaces and Coatings

|                                                                                                                                                                                                                    |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Impact of Oil Additive Characteristics on Biofuel Engine Wear Using Electron Microscopy and Confocal Microscopy</b><br>P. Rungsritanapaisan, P. Karin, D. Tanprayoon, R. Tongsri and K. Hanamura                | 113 |
| <b>Structure and Oxidation Behavior CrN Thin Films Deposited Using DC Reactive Magnetron Sputtering</b><br>A. Buranawong and N. Witit-Anun                                                                         | 122 |
| <b>Effect of SiO<sub>2</sub> Contents in TEOS-SiO<sub>2</sub>-OTES Hybrid Coating on Glass</b><br>K. Tapasa, U. Pantulap, B. Petchareanmongkol and W. Kaewdang                                                     | 128 |
| <b>Optical Transparent and Hydrophobic Properties of TEOS/OTES Hybrid Materials by Sol-Gel Processing</b><br>U. Pantulap, B. Petchareanmongkol, W. Kaewdang and K. Tapasa                                          | 134 |
| <b>Tribological Properties of Sintered Graphite-Steel Composites Containing Lignite Bottom Ash</b><br>C. Auechalitanukul, R. McCuiston, C. Saorerk, T. Limsombutan and E. Jindajia                                 | 140 |
| <b>Effect of Waste-Derived Calcium Sulfate Additions on the Tribological Properties of Sintered Steel-Based Material</b><br>C. Auechalitanukul, R. McCuiston, T. Sukantowong, W. Wachirapanee and T. Surmpakdeekul | 146 |
| <b>Structure and Morphology Study of Very Thin TiCrN Films Deposited by Unbalanced Magnetron Co-Sputtering</b><br>C. Paksunchai, C. Chantharangsi, S. Denchitcharoen, S. Chaityakun and P. Limsuwan                | 152 |
| <b>Surface Morphologies and Durability on Water Contact Angle of Titanium Dioxide Nanoparticle Thin Films</b><br>B. Toboonsung                                                                                     | 158 |
| <b>Effect of Substrate-Target Distance on the Structure of TiCrN Films Deposited from Mosaic Target by Reactive DC Magnetron Sputtering</b><br>N. Witit-Anun and A. Buranawong                                     | 163 |
| <b>Determination of Internal and External Surface Area of Atomistic Porous Carbons</b><br>P. Phadungbut, C. Bunsaksit, K. Dachdech and C. Kedtip                                                                   | 169 |

## Chapter 5: Functional Ceramics

|                                                                                                                                                                                                                                                                |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Effect of Binder Content on the Slip Rheology and Green Properties of Slip Cast Alumina</b><br>K. Somton, P. Laoratanakul and R. McCuiston                                                                                                                  | 177 |
| <b>Effect of Ferric Oxide Nanoparticles Incorporation on Structure and Electrical Properties of Modified BNKT Ceramics</b><br>P. Jaita, S. Manotham, K. Sanjoom, N. Lertcumfu and T. Tunkasiri                                                                 | 182 |
| <b>Mechanical and Electrical Properties of La<sup>3+</sup> Modified BNKZT Ceramics</b><br>P. Butnoi, S. Manotham, P. Jaita and T. Tunkasiri                                                                                                                    | 188 |
| <b>Preparation and Characterization of Ceramic Waste-Based Geopolymer Ceramic Composites for Substrate Culture Application</b><br>K. Kaewapai, N. Lertcumfu, P. Jaita, S. Manotham, T. Tunkasiri, P. Malasri and G. Rujijanagul                                | 194 |
| <b>Synthesis and Characterizations of Y-Doped BaCeO<sub>3</sub> Ceramic for Use as Electrolyte in Solid Oxide Fuel Cell</b><br>W. Somkhuan, P. Butnoi, P. Jaita, N. Lertcumfu, G. Rujijanagul and T. Tunkasiri                                                 | 200 |
| <b>Glass Batch Modification to Improve the Weathering Resistance in Soda-Lime Silicate Glass</b><br>E. Meechoowas, P. Jampeerung, K. Tapasa, U. Pantulap and T. Jitwatcharakomol                                                                               | 206 |
| <b>Effect of Sintering Temperature on Mechanical and Electrical Properties of Lead-Free Bi<sub>0.5</sub>(Na<sub>0.4</sub>K<sub>0.1</sub>)Ti<sub>0.98</sub>Zr<sub>0.02</sub>O<sub>3</sub> Piezoelectric Ceramics</b><br>P. Butnoi, S. Manotham and T. Tunkasiri | 212 |
| <b>Fabrication of Li<sub>0.06</sub>(K<sub>0.5</sub>Na<sub>0.5</sub>)<sub>0.94</sub>NbO<sub>3</sub> Nanofibers by Electrospinning Technique</b><br>S. Wongsanmai and T. Soitong                                                                                 | 218 |

|                                                                                                                                                                                                                                                                     |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Characteristic and Preparation of TiO<sub>2</sub>/PVP Nanofiber Using Electrospinning Technique</b><br>T. Soitong and S. Wongsanmai                                                                                                                              | 223 |
| <b>Influence of Thermal Treatment Temperature on Phase Formation and Bioactivity of Glass-Ceramics Based on the SiO<sub>2</sub>-Na<sub>2</sub>O-CaO-P<sub>2</sub>O<sub>5</sub> System</b><br>P. Kantha, N. Barnthip, K. Pengpat, T. Tunkasiri and N. Pisitpipathsin | 229 |
| <b>Influence of Mechanical Activation on the Phase Formation in the Synthesis of Cordierite from Talc and Andalusite</b><br>C. Vairojanakit and S. Sinchai                                                                                                          | 235 |
| <b>Effects of Bituminous Coal Ash Addition in Pottery Products</b><br>Y. Wonghom, S. Nilpairach, C. Mongkolkachit, T. Pornphatdetaudom and T. Wasanapiarnpong                                                                                                       | 242 |
| <b>Characterization and Properties of Lampang Kaolinite Clay for Standard Clay</b><br>S. Mulinta and S. Thiansem                                                                                                                                                    | 248 |
| <b>Effects of SnO<sub>2</sub>-SiO<sub>2</sub>-MgO-Bi<sub>2</sub>O<sub>3</sub>-Y<sub>2</sub>O<sub>3</sub> Additions on Liquid Phase Sintering Silicon Nitride</b><br>S. Wattanarach, S. Nilpairach, C. Mongkolkachit, T. Pornphatdetaudom and T. Wasanapiarnpong     | 254 |
| <b>Improvement of the Electrical Properties in Ba(Ti<sub>0.92</sub>Sn<sub>0.08</sub>)O<sub>3</sub> Lead-Free Ceramics by Ca Addition and Sintering Profile</b><br>P. Bomlai and N. Kongthong                                                                        | 258 |

## Chapter 6: Polymers and Composites

|                                                                                                                                                                                                                                                                 |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>The Effects of Replacement Metakaolin with Diatomite in Geopolymer Materials</b><br>S. Thammarong, N. Lertcumfu, P. Jaita, S. Manotham, T. Tunkasiri, N. Pimpha and G. Rujijanagul                                                                           | 267 |
| <b>The Effects of Biochar Additive on the Properties of Geopolymer Materials</b><br>P. Khamlue, N. Lertcumfu, P. Jaita, S. Manotham, T. Tunkasiri, P. Malasri and G. Rujijanagul                                                                                | 273 |
| <b>A Case Study of Recycled Poly(Lactic Acid) Contaminated with Petroleum-Based Thermoplastics Used in Packaging Application</b><br>P. Patanathabutr, P. Soysang, P. Leuang-On, P. Kasetsupsin and N. Hongsriphan                                               | 279 |
| <b>Preparation and Properties of Composite Films from Poly(Butylene Succinate), Poly(Butylene Adipate-co-Terephthalate) and Zeolite</b><br>N. Hongsriphan, N. Viratchaiboot, P. Indrasook and S. Hanbuakaeo                                                     | 285 |
| <b>Poly(Butylene Succinate) and Recycled Poly(Ethylene Terephthalate) Blends Adding GMA as Compatibilizer: Mechanical Properties and Chemical Resistance to Household Chemicals</b><br>N. Hongsriphan, S. Samangin, Y. Siriteeraphan and N. Yangcheepyuenyoodee | 291 |
| <b>Effect of ZrO<sub>2</sub> and MgO Addition on Structure, Mechanical and Thermal Properties of Metakaolin-Based Geopolymer Composites</b><br>R. Wongmaneerung                                                                                                 | 298 |
| <b>Effect of Poly(Vinyl Alcohol) on Thermoelectric Properties of Sodium Cobalt Oxide</b><br>C. Oopathump, D. Boonthuma and S.M. Smith                                                                                                                           | 304 |
| <b>Hydroxylated Natural Rubber Effect on Crystallinity and Mechanical Properties of PLA</b><br>N. Triampanichkul and P. Boochathum                                                                                                                              | 310 |
| <b>Effect of Alternative Fillers on the Properties of Rubber Compounds</b><br>W. Khongwong, N. Keawprak, P. Somwongsa, D. Tattaporn and P. Ngerchuklin                                                                                                          | 316 |
| <b>Injection Moldable Poly(Lactic Acid)-Poly(Butylene Succinate)-Activated Carbon Composite Foams: Effects of PLA/PBS Ratios</b><br>K. Hrimchum, D. Aussawasathien and T. Kajornprai                                                                            | 322 |
| <b>Effect of Alumina Addition on the Rheological Behavior of Shear Thickening Fluids</b><br>N. Nuampakdee, S. Sinchai and C. Gamonpilas                                                                                                                         | 331 |
| <b>Dynamic Vulcanization of NR/PCL Blends: Effect of Rotor Speed on Morphology, Tensile Properties and Tension Set</b><br>C. Thongpin and T. Tanprasert                                                                                                         | 337 |
| <b>The Effect of Poly(Butylene Adipate-co-Terephthalate) on Crystallization Behavior and Morphology of Poly(3-Hydroxybutyrate-co-3-Hydroxyvalerate)</b><br>S. Duangphet, D. Szegea, K. Tarverdi and J. Song                                                     | 343 |
| <b>Structural Modification of Styrene Maleic Anhydride Copolymers for Plant Bioactive Compound Extraction</b><br>P. Punyamonwongsa, P. Kakumyan, N. Saichana and B. Tighe                                                                                       | 351 |

|                                                                                                                                                                                                                             |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Effect of Zeolite on Early Strength of Portland Cement Mortars</b><br>R. Tanasalagul, T. Pantongsuk, T. Srichumpong, J. Junsomboon, W. Prakaypan and D. Chaysuwan                                                        | 358 |
| <b>Use of Water Glass from Rice Husk and Bagasse Ashes in the Preparation of Fly Ash Based Geopolymer</b><br>K. Gomonsirisuk and P. Thavorniti                                                                              | 364 |
| <b>Numerical-Experimental Model and Polynomial Regression Method for Interpretation of G-BHN Relation of Kraft-Based Fibrous Composites Evaluated by Using Brinell Analysis</b><br>R. Muangma, S. Wongsanmai and T. Soitong | 370 |

## **Chapter 7: Materials and Technologies for Environmental Engineering**

|                                                                                                                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Activated Carbon Loaded Lignocellulosic Fibers by Pulp Refining Process for Dye and Metal Ion Absorbing Paper</b><br>S. Witayakran, P. Somboon, J. Kongcrup, C. Sampoompuang and K. Lobyam           | 379 |
| <b>Hydrophobic and Oleophilic Filter Paper for Oil/Water Separation</b><br>S. Jindasuwan and S. Supothina                                                                                               | 385 |
| <b>Light-Enhanced Adsorptive Desulfurization of Dibenzothiophene Using Supported TiO<sub>2</sub>-ZrO<sub>2</sub></b><br>S. Thepwatee, N. Chekuntod, A. Chanchawee and P. Pitakjakpipop                  | 391 |
| <b>Synthesis of Modified Chitosan with Thiamine Hydrochloride as the Adsorbent for Calcium (II) Ion Removal</b><br>R. Sananmuang                                                                        | 397 |
| <b>Photoelectrocatalytic and Ultrasonic-Assisted Effects for Organic Dye Degradation Using Zinc Oxide (ZnO) Electrode</b><br>C. Lunkham, P. Ngerchuklin and C. Ponchio                                  | 404 |
| <b>Impact of Engine Oil's Additives on Particulate Matter's Micro-and Nanostructure Using Electron Microscopy Image Analysis</b><br>P. Koko, P. Karin, S. Rungsritanapaisan, R. Tongsri and K. Hanamura | 412 |
| <b>Study of Underflow Diameter, Vortex Finder, Cylindrical and Conical Lengths of a Hydrocyclone to Achieve High Separation Sharpness</b><br>P. Supachart, T. Swasdisevi and P. Wongsarivej             | 419 |