

# Table of Contents

## Foreword, Committee and Sponsors

## Chapter 1: Nano Materials

<b>Two Sizes CdSe Quantum Dots Co-Sensitized TiO<sub>2</sub>-Nano-SiO<sub>2</sub> Hybrid Photoelectrodes for Solar Cells Applications</b>	
R.B. Wang, H.H. Niu and L. Wan	3
<b>The Effect of PEG on Performance of Li<sub>0.96</sub>Na<sub>0.04</sub>Ni<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>O<sub>2</sub> as Cathode Material</b>	
C.X. Gong, O.E. Bankole and L.X. Lei	7
<b>The Constitutive Model and Processing Map for <i>In Situ</i> 5wt% TiB<sub>2</sub> Reinforced 7050 Al Alloy Matrix Composite</b>	
M.L. Wang, Z. Chen, D. Chen, Y. Wu, X.F. Li, N.H. Ma and H.W. Wang	11
<b>Porous LaFeO<sub>3</sub> with High Response to Acetone Synthesized from Biemplates</b>	
Y.Z. Ma, P. Song and Q. Wang	20
<b>Synthesis and Optical Properties of ZnS Nanoparticles Using Multi-Mercaptan-Terminated Thio Ether as Surface Modifier</b>	
W.C. Sheng, J. Tan, P. Wu, Q. Chen and Z.P. Zhou	24
<b>Synthesis, Structure and Properties of a Novel Metal-Organic Coordination Polymer, [Zn(NH<sub>3</sub>)<sub>2</sub>(BDC)]<sub>n</sub></b>	
N.N. Wu, C.X. Guo, G.A. Wu, Z. Cai and W.H. He	30
<b>Uv-Vis Spectrum Immunosensor Based on a Novel Phenyleneethynylene Derivative Functionalized Silica Nanospheres Labeled Anti-AFP</b>	
L. Li, C.C. Chu, S.A. Li, X. Wang, M. Yan and J.H. Yu	37
<b>Preparation of Nanoparticulate YFeO<sub>3</sub> by Microwave Method and its Load</b>	
P.S. Tang, L.X. Jia, J.Y. Zhu, Z. Jiang, T.T. Lin, C.W. Tang and H.F. Chen	41
<b>Synthesis and Oxygen Sensing Properties of Ti<sub>1-x</sub>Sn<sub>x</sub>O<sub>2</sub> Solid Solutions Nanoparticles</b>	
A.Q. Wu, X.Z. Fang, X.H. Lin, H.Q. Wang, Y.X. Wang, R. Zhang and L.S. Gao	45
<b>Effect of Si<sub>3</sub>N<sub>4</sub> on Properties of Aluminum Borate Whisker/Aluminum Phosphates Ceramic</b>	
Z.S. Hu, H.R. Geng, X.Q. Hou and J.F. Leng	50
<b>A Study on Improving the Adhesiveness between Granite and Asphalt by Nano-Scaled Calcium Carbonate</b>	
X.H. Hao, Y.M. Wang and A.Q. Zhang	54
<b>Synthesis and Characterization of NiO Doped SnO<sub>2</sub> Nano-Flowers</b>	
W.P. Tang	58
<b>Hydrothermal Synthesis and Ethanol-Sensing Properties of MoO<sub>3</sub> Nanobelts</b>	
M.N. Liu, Q.Q. Chen, X. Lu, L.F. Ge, L. Yin, R. Zhang and D.L. Chen	61

## Chapter 2: Polymers

<b>Study on Synthesis and Characterization of Unsaturated Polyester by Enzyme-Catalyzed</b>	
F.J. Shao, Q. Yang, L.Y. Li and D.N. Lu	67
<b>Synthesis and Characterization of N,N-Dimethyl Dodecyl-(4-Vinyl Benzyl) Ammonium Chloride</b>	
J. Li, X.J. Song and R.J. Yang	71
<b>Thermal Properties of Hyperbranched Polymer/HTPB-PU IPN</b>	
X.J. Song and Y.J. Luo	76
<b>Thermal Cure and Ceramization Kinetics of Perhydropolysilazane</b>	
F.L. Ma, H.M. Qi, Y.P. Zhu, X.W. Ren and F. Wang	81
<b>Synthesis of Poly[Cyclotriphosphazene-Co-(4, 4'-Sulfonyldiphenol)] Microspheres Grafted by Water-Soluble Chitosan</b>	
X.Y. Zhang, T.W. Han, Q. Zhang and J.B. Wu	87
<b>Influence of BaSiO<sub>3</sub> Doped on the Properties of BST Capacitor Ceramics</b>	
X.Y. Huang, M.S. Huang, C.H. Gao and Z.G. Chen	91

<b>Modeling of Polyurethane's Shape Memory Effects and Recovery Time under Different Recovery Temperatures</b>	95
L. Luo, Y.X. Jia, X.X. Wang, Z.J. Wang, J.P. Gao and X.S. Yi	
<b>Predicting Polyurethane Shape Memory Behaviors in Stress-Controlled Situations Using a Viscoelastic Model</b>	101
Z.J. Wang, L. Luo, Y.X. Jia, J.P. Gao and X.S. Yi	
<b>A Novel Conjugated Polyfluorene: Synthesis, Characterization and Application in Flow Injection Electrochemiluminescence for Detection of Bovine Serum Albumin</b>	107
S.A. Li, S.W. Wang, C.C. Chu, X. Wang, M. Yan, J.H. Yu and S.G. Ge	
<b>Formation and Mechanical Properties of Instrument Panel Skins Produced by PVC Powder Slush Molding Processes</b>	111
F. Wang, J. Chen, W.G. Yao, J. Sun, S.P. Yu, X.Y. Wen and Y.X. Jia	
<b>Analysis of Prospecting Model of Xiongcun Cu (Au) Deposits Xietongmen County, Tibet</b>	116
J.G. Wang, Y.Y. Zheng and S.B. Gao	
<b>DABCO-Directed Self-Assembly of Pyrene-Centered Porphyrin Pentamers</b>	123
Z.D. Yuan, J.X. Wang and N. Sheng	
<b>Adsorption of Benzene and Aniline Using a Novel Hypercrosslinked Polymeric Adsorbent Modified by Phenolic Hydroxyl Group</b>	128
X.H. Yuan, W.H. Guo, Y. Lei, Y.Q. Liu, J.Y. Wu, W.Q. Qiu, J. Hu and S.S. Cao	

## Chapter 3: Composites

<b>The Research Progress of the <i>In Situ</i> Metal Matrix Composites</b>	137
L. Jiao, Y.T. Zhao, X.L. Wang, Y. Wu, S.N. Yang and K.N. Li	
<b>Corrosion Resistance of Plasma Sprayed AT13 Composite Ceramic Coating on Mg</b>	142
E.L. Lu, Y. Chen and S. Lu	
<b>A Self-Repair Mode for Capillary Reinforced Polymer Composite</b>	147
X.H. Yuan, J.Y. Wu, Y.Q. Liu, J.X. Mao, X.T. Ou, Z.R. Han and X. Jiang	
<b>Polyacrylonitrile Based Carbon Fibers Obtained from a Melt Spun Route</b>	151
Y.Z. Wang, S.G. Wang and J.L. Liu	
<b>Study on Physical and Mechanical Properties of Cu/MoS<sub>2</sub> Composites</b>	156
D.Q. Ma, J.P. Xie, J.W. Li, A.Q. Wang, W.Y. WANG, L.K. Cui and Y.D. Zhang	
<b>Toughness Enhancement by Aligned Multi-Walled Carbon Nanotubes Pullout from Polymer Matrix of Multi-Scale Composites</b>	160
Y.L. Guo, G.W. Zhu, P. Qu and Y.X. Jia	
<b>Synthesis of AlN-SiC Ceramics by Hot Pressing</b>	166
L.J. Zhou, Y.X. Zhao and F.T. Meng	
<b>Isothermal Oxidation Behavior of AlN-TiB<sub>2</sub> Ceramics Synthesized by SHS-HIP</b>	170
L.J. Zhou, Y.X. Zhao, H.B. Li, Y.T. Zheng and F.T. Meng	
<b>Piezoresistive Property of Carbon Fiber Reinforced Plastics</b>	174
J.D. Zuo and C.Y. Luo	
<b>Preparation and Microstructure of Nano ZrB<sub>2</sub> Reinforced Aluminum Matrix Composites</b>	179
H.M. Wang, G. Li, Y. Cai and Y.T. Zhao	
<b>Numerical Analysis on the Cure-Induced Deformation of Fiber Composite Laminates</b>	183
P. Li and Y.X. Jia	
<b>Numerical Analysis on the Influence of Interface on the Mechanical Behavior of Unidirectional Fiber Composites under Different Loads</b>	188
P. Qu, Y.X. Jia, G.W. Zhu, Y.L. Guo and X.C. Sun	
<b>Interfacial Effect on Bending Property of Al/Cu/Al Laminated Composite Produced by Asymmetrical Roll Bonding</b>	194
X.B. Li, G.Y. Zu and P. Wang	
<b>Fabrication &amp; Microstructure of TiB<sub>2</sub>+TiC Duplex Particulates Reinforced Carbon Steel Matrix Surface Composite</b>	198
C.Q. Guo	
<b>Comparison of Mechanical and Frictional Properties of PTFE Matrix Composites Reinforced by Different Fibers and Graphite</b>	203
H.X. Xu, X.H. Yuan, E.B. Zhu, S.L. Li, L. Chen and Z.R. Han	

<b>Facile Synthesis of Hierarchical Architecture FePO<sub>4</sub>/C Composite Microspheres</b>	209
S.S. Wang, L.F. Mu, S. Li, H. Li, Z.S. Wen, S.J. Ji and J.C. Sun	
<b>Fabrication of Bifunctional SiO<sub>2</sub>/Europium-Polyoxometalates/Ag Particles and their Luminescence and Catalysis Properties</b>	216
J. Wang, S.H. Fan, W.Q. Zhao, W.K. Li and X.L. Lu	
<b>Synthesis and Characterization of g-C<sub>3</sub>N<sub>4</sub>/<math>\alpha</math>-Fe<sub>2</sub>O<sub>3</sub> Composites with Enhanced Photocatalytic Activity</b>	225
L.Y. Huang, R.X. Zhang, X.J. Sun and X.N. Cheng	
<b>Fabrication and Microstructure of HA Containing Composite Coating on AZ91 Biomedical Magnesium by Plasma Electrolytic Oxidation</b>	229
M. Wang and Y.L. Wang	

## Chapter 4: Biomaterials and Tissues

<b>Effects of Annealing on Microstructure and Mechanical Properties of Backward Extruded Mg-0.5Mn-1Nd Alloy</b>	235
N. Ma, Q.M. Peng, H. Li and J.L. Pan	
<b>Ultra-High-Strength Concrete-Filled FRP Tubes: Compression Tests on Square and Rectangular Columns</b>	239
T. Ozbakkoglu	
<b>Antimicrobial Study of Symmetrical Gemini Cationic Surfactant Based on N-Hexadecyldimethylamine</b>	245
Z.C. Miao, Y.W. Wang, X. Zhang, L. Zhang, Z.X. Wang and Y.Y. Li	
<b>Chemiluminescence Enhancement Effect for the Determination of Acetaminophen with the Catalysis of Manganese Deuteroporphyrin (Mn(III)DP)</b>	249
Y.J. Chao, L.X. Xie and W. Cao	
<b>Fabrication of Nanostructured Hierarchical Coatings Composed of Calcium Phosphate/Titanate on Titanium Substrate</b>	253
C.D. Zhang, D.Q. Xiao, Y.K. Fu, K. Duan, X. Lu and J. Weng	
<b>Friction/Wear Properties of Ta-Doped TiO<sub>2</sub> Films on Surface of Nano-Grained 316L</b>	259
H.H. Shao, X.Y. Jiang, Y.T. Peng, C. Chen and R. Zhai	

## Chapter 5: Green Materials

<b>Preparation and Characterization of PVDF Modified Ultrafiltration Membrane for Purification of Hg in Water</b>	265
X.J. Wang, X.J. Lu, W.Y. Xu, J.C. Zhu and L.G. Wang	
<b>Synthesis of 5-Cyano-3-(4-Chlorobutanoyl) Indole in 1-Butyl-3-Methylimidazolium Chloroaluminate</b>	270
Y.X. Jiang, H.J. Zuo, Y.J. Shen and F.P. Yi	
<b>Study on the Adsorption Performance of Zn(II) over Bentonite</b>	276
G.X. Pan, Y.J. Zhang, D.G. Chai and Y.F. Yu	
<b>Synthesis and DNA Binding Studies of Platinum (II) Complexes Based on Cyclodextrin</b>	280
S.P. Tang, Y.L. Feng, Z.F. Xu and D.P. Wang	
<b>Biocompatibility of Degradable Stents Constructed Different Biomaterials</b>	287
C.H. Ma	

## Chapter 6: Optical and Electronic Materials

<b>The Analysis and Design of Three-Phase Static Inverter Deadband Effect and Harmonic Suppression</b>	293
Q.M. Yan	
<b>Optimization of Thermal Emittance Tuneability of La (Sr, Ca)MnO<sub>3</sub> Thin-Film Materials in 173-373 K</b>	297
C.H. Wu, J.W. Qiu, M. Xu, J.B. Wang, H.P. Zuo, B.S. Zhang, L. Li and Y.Z. Zhao	
<b>Preparation of TiO<sub>2</sub> Photocatalysis Antibacterial Ceramics</b>	302
J. Ding	

**The Influence of Top Layer on ZnO/Cu<sub>2</sub>S/ZnO Films in Optoelectric and Photocatalytic Performance**

F. Xu, S.N. Sun, Y.X. Wang, F.L. Bian, H. Wang, Z.X. Fu, H.S. Wang and H.N. Cui

306

## **Chapter 7: Superconductive and Magnetic Materials**

**Heat-Treatment Temperature Influence on Structure and Magnetic Properties of SrFe<sub>11.85</sub>Sm<sub>0.15</sub>O<sub>19</sub> Ferrite Nanofiber**

X.F. Meng, Y.B. Hong and Y.K. Ji

313

## **Chapter 8: Structural and Constructional Materials**

**Research on the Properties of Composite Portland Cement with High Volume of Industry Waste**

B.L. Du, X.H. Fu, W.H. Tao and X. Jin

319

**Study on Hydraulicity and Alkali Activation of Ferroalloy Slag**

B.L. Du, X.H. Fu, W.H. Tao and X. Jin

323

**The Experimental Study on Consolidation of Acrylic Non-Aqueous Dispersion for Wet-Area Earthen Ruins in Southwest China**

Y. Wu

327

**Analysis of the Flexible Prismatic Pair Processing Errors of a Flexible Parallel Vibration Platform with High Frequency**

Q.Z. Yang, D.M. Yuan, J.Q. Zhuang and D.F. Cao

331

**Cementitious Property Comparison of Steel Slags with Different Basicity**

Z.B. Li, X.G. Zhao, S.Y. Zhao and T.S. He

337

**Analysis and Simulation of a Hybrid Mechanism with 2R-3T of Special Machining Platform**

Q.Z. Yang, B.B. Yao and D.F. Cao

341

**Study on Properties of Al<sub>2</sub>TiO<sub>5</sub> Coating on Ti-6Al-4V Titanium Alloy**

N.S. Xie and J. Wang

348

**Research on Temperature Effect of Autogenous Deformation and Mechanical Properties of HPC**

X.H. Gan, C.H. Jiang and S.L. Huang

352

**Study on Producing Sand-Lime Bricks with Iron Ore Tailings and Phosphogypsum and other Solid Wastes**

W.H. Tao, X.H. Fu, G.L. Chen and B. Wu

357

**Study on Preparation and Properties of Foam Glazed Hollow Bead Thermal Insulation Mortar**

H.T. Yu, W.H. Tao, X.H. Fu, B.L. Du and Y.P. Chen

361

**The Research and Development of High Strength Spring Steel with Long Service Life**

B. Xiao, Y.C. Lei and X.D. Wu

365

**Research on the Melting Temperature of CaO-SiO<sub>2</sub>-B<sub>2</sub>O<sub>3</sub> Ternary Slag Systems**

L.L. Yang, H.M. Wang, X. Zhu and G.R. Li

370

**Microstructure and Hardness of 7055 Aluminum Alloy Processed by Circular Cryogenic-Aging Treatment**

H.M. Wang, G. Li, Y. Cai, Y.T. Zhao, J.J. Wang, K.X. Gu and H. Zhang

374

**Thermodynamic Condition and Behavior of Precipitates in Al<sub>2</sub>O<sub>3p</sub>/7055 Composites with Cryogenic Treatment**

H.M. Wang, T.Y. Xing, G. Li, X.T. Yuan, Y.T. Zhao, J.J. Wang, K.X. Gu and H. Zhang

378

**Compare the Fluxing Effect of Boron Sludge and CaF<sub>2</sub> on CaO-Based Steelmaking Slag**

H.M. Wang, X. Zhu, G.R. Li, L.L. Yang, C.X. Peng and C.C. Qu

382

**Nanocrystalline Microstructure in AZ91 Magnesium Alloy Prepared with Cryogenic Treatment**

G.R. Li, H.M. Wang, Y. Cai, Y.T. Zhao, J.J. Wang, K.X. Gu and H. Zhang

386

**Behavior of β(Mg<sub>17</sub>Al<sub>12</sub>) Phases in Mg-Al Alloy Subject to Cycling Cryogenic Treatment**

G. Li, H.M. Wang, Y. Cai and X.T. Yuan

390

**Manufacture and Analysis of Directional Solidification Organization of CMSX-6 Nickel-Base Superalloy**

X.F. Liang, Y.T. Zhao, Z.L. Zuo and Z.H. Jia

394

<b>Effect of Fiber Coating on Properties of Ni-MF/Al<sub>2</sub>O<sub>3</sub> Composites</b>	398
L.H. Liu, Z. Wang, G.P. Shi, Y. Ma, S.A. Feng and C. Wu	
<b>Influence of Extrusion Methods on Microstructure of Mg-Al-Zn Alloy</b>	402
Y. Cai, G. Li, X.T. Yuan, H.M. Wang, Y.T. Zhao and J.J. Wang	
<b>Dislocation Character and Evolution Mechanism of Particles Reinforced Aluminum Matrix Composites Impacted by Pulsed Electromagnetic Field</b>	406
X.T. Yuan, G. Li, H.M. Wang, Y. Cai, Y.T. Zhao and X.Y. Zhang	
<b>Effects of Heat Treatment on Microstructure and Properties of AZ91D Magnesium Alloy</b>	410
M. Wu, F. Long, H.R. Geng and F. Yang	
<b>High-Temperature Oxidation Resistance of Austenitic Stainless Steels</b>	414
D.S. Li, D. Li, H. Dou, P. Gao, Y. Liu, X.J. Chen, X.C. Jiang and J.J. Pei	
<b>Effect of Impulse Voltage on Microstructure and Corrosion Resistance of Microarc Oxidation Coatings on AZ80 Magnesium Alloy</b>	418
J. Ma, Y.S. Yang, X.C. Wang, J. Zhang, S. Liu and X.B. Yi	
<b>Investigation on the Reaction of Refractories with 16MnRE Steel</b>	423
D. Wang and Y.F. Guan	
<b>Analysis of Silicone Rubber Elastomer Elastic Failure in Small-Size Flexible Joint at Low Temperature</b>	427
C. Wang, J.X. Ren, Y. Liu, W.Q. Hao and J.X. Yang	
<b>The Application of Wooden Building Materials in Contemporary Architectural Design</b>	434
Z.M. Xu	
<b>Annealing and Deposition Parameters Influence on the Performance of AlN Thin Films</b>	441
T.L. Gui and S.D. Jiang	
<b>Advances in Development of Titanium Alloys for Spinal Fixation Applications-Titanium Alloys with High Fatigue Strength and Low Springback for Spinal Fixation Applications-</b>	446
M. Niinomi, M. Nakai, J. Hieda, K. Cho and K. Narita	
<b>Development of Changeable Young's Modulus with Good Mechanical Properties in β-Type Ti-Cr-O Alloys</b>	453
H.H. Liu, M. Niinomi, M. Nakai, J. Hieda and K. Cho	
<b>Foamed Glass-Ceramics Made from Red-Mud</b>	461
Z.N. Ye, Y.W. Wang, H. Jiang, N. Li and S.Q. Liu	

## Chapter 9: Other Topics

<b>Research and Design of an Equipment for Multi-Point Press Forming Sheet Metal Parts</b>	467
R.Y. Ma, H. Ding and D.Y. Yang	
<b>Influence of Negative Voltage on Micro-Arc Oxidation of Magnesium Alloy under Two Steps Voltage-Increasing Mode</b>	472
X.Z. Jiang, S. Lu, L. Tang, Z.X. Wang and J. Chen	
<b>Formaldehyde Gas Sensor Based on Pentacene Organic Thin-Film Transistor</b>	477
Y.C. Chen, J. Zhong and L. Zhang	
<b>Design and Test of Controlled Droplet Sprayer for Facility Agriculture</b>	481
Y. Gong, X.B. Chen, Y. Liu, L. Pei and J.C. Zhang	
<b>Discussion on Applicability of the Technology of Using Light to Trap in the Field of Pests and Diseases Control in Tea Plantation of China</b>	487
Y. Liu, C. Liu, J.C. Zhang and S.Y. Zhao	
<b>Effects of Sr and Mn-Doping on the Electrical Properties of CaBi<sub>4</sub>Ti<sub>4</sub>O<sub>15</sub>-Based Ceramics</b>	494
B. Fu, Y.L. Hou, T. Li and X.H. Fu	
<b>Structure and Dielectric Properties of Mn, Co, and Ni-Doped LaSrFeO<sub>3</sub> Films</b>	499
B. Fu, Y.L. Hou, W.B. Wu and X.H. Fu	
<b>Research of PSS on the Inhibiting Effect of Low Frequency Oscillation</b>	504
A. Li	
<b>Zinc Coating Failure Analysis and Sheet Formability during Hot-Dip Galvanized Sheet Stamping</b>	510
L.G. Wang, T. Zhou and Y. Huang	
<b>Catalytic Degradation of Rhodamine B with Cobalt Phthalocyanine Supported Hydrotalcites</b>	515
M.H. Xu and M.L. Zhu	

<b>Influence of Compound Bonding Agent on the Performance and the Microstructure of Proppant</b>		
J.J. Sun, L.L. Qin and X.H. Song		519
<b>Finite Element Simulation and Experimental Study on Isothermal Forging Technology for a Complex-Shaped Titanium Alloy Wing</b>		
F. Cheng and H.Y. Jiang		523
<b>The Mineral Composition and Microstructure of MAC Cementing Material Prepared Using Hydrated Lime</b>		
Y.J. Liu, L. Chen, S.Q. Liu and R.X. Shi		527
<b>Reaction of CO<sub>2</sub> and CS<sub>2</sub> with Aniline Catalyzed by AlCl<sub>3</sub> under Mild Condition</b>		
H.X. Xu and X.H. Yuan		531
<b>Study on Erosion Wear Property of Nickel-Chromium Cast Iron</b>		
J.P. Xie, L.J. Zhang, A.Q. Wang and X.H. Shao		535
<b>Extraction Joined with Adsorption and Catalytic Oxidation of Dibenzothiophene with Commercially Available Tungsten Carbide</b>		
Y.H. Xu, J.J. Zhou, T. Zhou, Y.H. Chao, S. Yan, X.C. Jiang, X.J. Chen, W.S. Zhu and H.M. Li		539
<b>Size Error and Modification of V-Groove in Thermal Microimprint</b>		
H.X. Wang, J.B. Li and Y.H. Lv		543
<b>Study of the Impact Abrasive Wear of New Super-High Manganese Steel</b>		
W.Y. WANG, J. Xu and J.P. Xie		550