

# Table of Contents

## Preface, Committees and Sponsors

## Chapter 1: Research on Mechanics and Dynamics of Systems in Mechanical Engineering

|                                                                                                                                                                                            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Dynamic Simulation of the Movement of the Rocket Launch Tower on ADAMS Based on the Material of the Tower</b><br>J. Zhou, J.S. Ma, Z.X. Sun and C.G. Wu                                 | 3  |
| <b>A Simple Method for Calculating the Bending Modal Frequencies of an Underwater Simply Supported Beam with Hydrodynamic Study</b><br>R. Tang, D.J. Shang and Q. Li                       | 7  |
| <b>Study on the Basic Problems of Dynamics by Induction and Generalization</b><br>Z.Q. Xu and K.G. Qian                                                                                    | 12 |
| <b>Nonlinear Vibration of Functionally Graded Material Cylindrical Shell Based on Reddy's Third-Order Plates and Shells Theory</b><br>L. Dong, Y.X. Hao, J.H. Wang and L. Yang             | 18 |
| <b>Experimental and Finite Element Study on Mechanical Behavior of Bolted Joint with Bolt Clearance in Transmission Tower</b><br>B.R. Zhu, H.J. Xing and J.B. Yang                         | 25 |
| <b>Mechanical Analysis on the Splicing Form of Cross-Section Multiple Angle Steel for Transmission Line</b><br>Y. Gao, J.K. Han and Q.H. Li                                                | 30 |
| <b>Dynamic System of a Mechanical Press Driven by SRM for Flexible Process</b><br>W.F. Shang                                                                                               | 37 |
| <b>Numerical Simulation of Water Removal Process in the Microstructure of Gas Diffusion Layer with Mechanics Properties and Material Properties</b><br>C. Sun, Q. Du, Y. Yin and B. Jia    | 41 |
| <b>Study on Optimization of Dynamic Characteristics of Turbo Generator Foundation</b><br>Y.H. Sun and Q. Zhang                                                                             | 45 |
| <b>Three-Dimensional Simulation of Water Droplet Movement in PEM Fuel Cell Flow Channels with Fluid-Mechanics Properties and Different Deformations of GDL</b><br>N. Bao, Q. Du and Y. Yin | 53 |
| <b>Study on some Aspects of Breakup Characteristics of Power-Law Fluid with Impinging Jets Based on Mechanics Properties</b><br>E.D. Wang, Y. Yin and Q. Du                                | 57 |
| <b>Analysis of Dynamic Behavior of Ultra-High Voltage Porcelain Arresters with New Type Lead Dampers</b><br>X.S. Zhang, Z.B. Dai, Z.C. Lu and C.C. Cui                                     | 61 |
| <b>Crashworthiness Analysis and Optimization of Thin-Walled Square Tube with Pyramidal Ripples Based on Mechanics Properties</b><br>X.G. Hu and J.B. Yang                                  | 69 |
| <b>Dynamic Characteristics Simulation of the Digital Hydraulic Cylinder Based on AMESim</b><br>X.S. Guo, Q.C. Li and J.L. Xiao                                                             | 75 |
| <b>Study on Building Seismic Design Based on Mechanics Properties with Economical Assessment</b><br>M. Zhong and W. Ji                                                                     | 79 |
| <b>Effects of the Launch Speed on Hydrodynamic Force of the Underwater Vehicle Vertical Launch with the Gas Curtain</b><br>H.J. Liu, X.Z. Peng and Z.Z. Zou                                | 84 |
| <b>Graphic Method for Design of Eccentric Slider-Crank Mechanism and Analyzing of Feasible Region</b><br>C.Z. Hao, S.H. Ma, G.X. Cai, J.G. Yu and Z.N. Jia                                 | 88 |
| <b>Analysis and Optimization of Level-I Vibration Absorption of Single Drum Vibratory Roller</b><br>X.B. Zhang, D.W. Zhang and Z.X. Feng                                                   | 93 |

|                                                                                                                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Trajectory Planning and Prediction Guidance Based on the Moon-Earth Return Reentry Dynamics</b><br>B. Zhao, N.G. Cui, J.F. Guo and P. Wang                                                           | 100 |
| <b>Numerical Simulation of Sphere Impacting Water by SPH with Hydrodynamics</b><br>Q.L. Qu, J.L. Wu, B.D. Guo and Y.P. Qin                                                                              | 104 |
| <b>Reentry Trajectory Planning Based on the Secondary Reversal Dynamics for the Second Generation Reusable Launch Vehicles</b><br>B. Zhao, N.G. Cui, J.F. Guo and Y. Fu                                 | 109 |
| <b>Hydrocyclone Velocity Flow Simulation and Experimental Study Based on Fluid Mechanics</b><br>H. Xu, X.H. Chen and Y. Yao                                                                             | 113 |
| <b>Hydrocyclone Two Phase Flow Experimental Research Based on Fluid Mechanics</b><br>H. Xu and X.H. Chen                                                                                                | 117 |
| <b>Vibration Reduction by Optimal Design of Powertrain Mounting System of Heavy Truck Based on SQP Method</b><br>H. Jing, C. Li, F.Y. Liu and B. Kuang                                                  | 121 |
| <b>Roller Element Bearing of Mine Ventilating Fan with Fault Diagnosis Based on Mechanics Properties and RBF Neural Network</b><br>Y.H. Zhang, C. Li, H. Jing and B.B. Gao                              | 125 |
| <b>Application Study of the Vehicle's Steering System with Mechanical Mechanics</b><br>L.Q. Meng and Z.W. Wang                                                                                          | 130 |
| <b>Research on the Initial Disturbance of Vehicular Missile with System Vibration Analysis</b><br>C. Zhang and Y. Jiang                                                                                 | 134 |
| <b>Launching Dynamics Simulation of Ship-Board Rocket Gun</b><br>W. Zeng and Y. Jiang                                                                                                                   | 140 |
| <b>Kinematic Analysis and Simulation of an A/C Axes Bi-Rotary Milling Head with Zero Transmission</b><br>Y. Chen, M.F. Huang, B. Shi, M.M. Xiao, R.K. Hu and J.S. Tang                                  | 146 |
| <b>Dynamics and Trajectory Tracking of a Spherical Rolling Robot on an Inclined Plane</b><br>T. Yu, H.X. Sun, Q.X. Jia, Y.H. Zhang and W. Zhao                                                          | 151 |
| <b>The Motion Simulation and Analysis of Reinforced Flip Device Based on UG NX7.5</b><br>J. Sun, W. Zhu, H.L. Tang, L. Tian and W. Liu                                                                  | 155 |
| <b>Heat Design of Multi-Functional Structure of Electronic Equipment with Material Properties in Control System</b><br>J.H. Wu, Q. Zhou, Q. Zhou, J. Chen, H.P. Si, K.Y. Lin and C.B. Zhang             | 159 |
| <b>The Finite Element Thermal Analysis for Lubricating Oil Transfer Pump in Different Convection Heat Transfer Coefficient with Special Material Properties</b><br>J.N. Xu, W. Lv, W.J. Lv and D.Y. Zhu | 167 |

## **Chapter 2: Research on Material Engineering and Material Applications**

|                                                                                                                                                                                                 |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Microstructure and Mechanical Properties Analysis of AL-5052 Self-Pierce Riveting Joint in Material Application Engineering</b><br>J.N. Xu, X.C. He, Y. Tang, Y.F. Ding, Y.B. Hu and K. Zeng | 173 |
| <b>Effect of Activated Carbon Materials' Surface Texture Parameters on Separation Factor for Coal Mine Methane</b><br>X. Yang, Y.S. Liu and Y.L. Li                                             | 177 |
| <b>Preparation of Silver Doped PMN-PZT Ceramics and Their Energy and Materials Engineering Applications</b><br>J.C. Kang and G.P. Zheng                                                         | 181 |
| <b>Spectral Properties of the Optoelectronic Material Rhenium (I) Tricarbonyl Complexes with Bipyridine Ligand Containing Triphenylamine Moiety</b><br>H.Y. Xia and F. Zhao                     | 185 |
| <b>A Study on Preparation Methods of <math>\text{LiNi}_{0.5}\text{Mn}_{0.5}\text{O}_2</math> Cathode Materials</b><br>F.R. Lang                                                                 | 189 |
| <b>Optimization of Sanding Parameters for Wood Surface of Plantation-<i>Magnoliaceae glanca Blume</i></b><br>X.B. Li, J.D. Huang, C.W. Su, J.J. Luo and L. Lai                                  | 193 |

|                                                                                                                                                                                                                |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Effects of Surfactant Agent and PTFE Content on Surface Morphology and Microstructure of Ni-P-PTFE Composite Coating</b><br>C.Q. Fu, X. He and Z. Wang                                                      | 198 |
| <b>The Status and Analysis of the Equipment for Fine Mineral Particle Classification in Coal Wash Plants</b><br>J. Ma, S.H. Zou, X.Z. Wang, B. Hui, X.D. Liu, S.J. Chen, Y.N. Li and H.F. Chen                 | 202 |
| <b>Specific Rebinding of Protein Imprinted Calcium Polyacrylate/Alginate Hybrid Materials via the Adjustment of pH Values</b><br>W.K. Cui, K.Y. Zhao, J.F. Wei and G.X. Cheng                                  | 206 |
| <b>Concentrating Elastic Waves by Isotropic Homogeneous and Reflectionless Materials</b><br>J. Hu and X.Y. Lu                                                                                                  | 210 |
| <b>Mechanical Properties, Morphology and IR Analysis of the Proban CC-Treated Celluloses</b><br>S.F. Li, J.Y. Liu and B.W. Cheng                                                                               | 214 |
| <b>Effects of Different Carbon Sources on Performance of LiFePO<sub>4</sub>/C Composite Material</b><br>C. Yang, Y.M. Li, S. Liu and Y.C. Yao                                                                  | 218 |
| <b>Preparation and Magnetic Properties of Nanocrystalline (Fe,Cr)-N</b><br>W.J. Feng, C.Y. Wang and H.H. Zhang                                                                                                 | 222 |
| <b>Numerical Simulation of Transient Response of Inlet Relative Humidity for High Temperature PEM Fuel Cells with Material Properties</b><br>X.L. Chen, B. Jia, Y. Yin and Q. Du                               | 226 |
| <b>Electronic Structure and Optical Properties of SiC Nanotube Material with Silicon Antisite Defect</b><br>K.J. Li, J.X. Song and H.X. Liu                                                                    | 230 |
| <b>Analysis of Voltage Losses in High Temperature Proton Exchange Membrane Fuel Cells with Properties of Membrane Materials and Fluent Software</b><br>X.L. Yang, Y. Yin, B. Jia and Q. Du                     | 235 |
| <b>Surface Morphology Studies on PBI Membrane Materials of High Temperature for Proton Exchange Membrane Fuel Cells</b><br>Z.Y. Zhai, Y.G. Shen, B. Jia and Y. Yin                                             | 239 |
| <b>The Carbon Deposition during Iron Ore Reduction in Carbon Monoxide</b><br>S.H. Geng, W.Z. Ding, S.Q. Guo and X.G. Lu                                                                                        | 243 |
| <b>Comprehensive Utilization of Oil Shale with Analysis of Material Properties</b><br>Z.Y. Yuan                                                                                                                | 247 |
| <b>Ni Doped LiMn<sub>2</sub>O<sub>4</sub> Prepared by a Flameless Combustion Synthesis</b><br>G.Y. Liu, B.S. Wang, Y. He and J.M. Guo                                                                          | 251 |
| <b>Phase Structures of LiMn<sub>1.95</sub>Fe<sub>0.05</sub>O<sub>4</sub> Prepared by Solution Combustion Synthesis and Molten-Salt Combustion Synthesis Methods</b><br>G.Y. Liu, B.S. Wang, Y. He and J.M. Guo | 255 |
| <b>Sn-Ni Nano Particle Prepared by a Chemical Reduction Method</b><br>G.Y. Liu, Z.L. Huang, Z.Z. Yi, L.D. Sun and H.Y. Sun                                                                                     | 259 |
| <b>Influence of Carbon Doping on Microstructure and Tribological Properties of CrN Coating</b><br>P.F. Hu, G.J. Yin and S.K. Zhou                                                                              | 263 |
| <b>Synthesis and Characterization of ZnS Nanoparticles by Using Polyvinylpyrrolidone as Stabilizer</b><br>X.H. Fan, H.J. Liu, Y.M. Chen and T. Sun                                                             | 269 |
| <b>Preparation of a Hydrophilic PVDF Membranes by Electron Beam Induced Grafting Polymerization of Acrylic Acid</b><br>L. Yang, J.F. Wei, K.Y. Zhao and Z.A. Luo                                               | 273 |
| <b>Optical Energy Gap and Microhardness of Cu<sub>3</sub>N Thin Films</b><br>X.M. Yuan, T. Liu, X.H. Zhang and P.X. Yan                                                                                        | 277 |
| <b>Thermal Design, Analysis and Verification of Chip-Level MCM with Properties of Semiconductor Materials</b><br>J.H. Wu, Q. Zhou, Q. Zhou, J. Chen, H.P. Si, K.Y. Lin and C.B. Zhang                          | 280 |
| <b>Fabrication of High-Quality CuInSe<sub>2</sub> Films by Coating, Compaction and Selenization</b><br>J.G. Xu, Y.L. Wang and H.B. Nie                                                                         | 287 |
| <b>The Experimental Study of Diffraction Angle of Aluminum Alloy 3003</b><br>N.Q. Duan, J.L. Ren and R.Q. Pang                                                                                                 | 291 |

|                                                                                                                                                                                                               |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Treatment Effect of Coking Wastewater Using Three-Phase Biological Fluid-Bed with New Ultrastructure Biological Carriers Based on Properties of Biological Materials</b><br>N. Li, H.B. Liu and J.L. Huang | 297 |
| <b>Characterization and Properties of CrTiN Films</b><br>T. Liu, X.H. Zhang, X.M. Yuan, X.H. Zheng and G.A. Zhang                                                                                             | 301 |
| <b>Microstructure and Mechanical Properties of Mo<sub>2</sub>FeB<sub>2</sub> Based Cermets Containing SiC Whisker</b><br>H.Z. Yu, W.J. Liu, L. Ying and M. You                                                | 304 |
| <b>Thermal Performance Analyses of Heat Pipe of All-Glass Evacuated Tubular Solar Collectors with Properties of Pipe Materials</b><br>W.B. Chen and L.X. Zhang                                                | 308 |
| <b>Determination of Stress-Strain Constitutive Relation of Echelle Grating Al Film by Nanoindentation Test and Simulation</b><br>G.F. Shi, G.Q. Shi, L.S. Song and Z.W. Xu                                    | 312 |
| <b>The Effects of Diffusion and Temperature-Dependent Properties on Generalized Thermoelastic Behaviors in Thermal Dynamics</b><br>Y.P. Liu and S.H. Shi                                                      | 318 |
| <b>Mechanical Performance of Ti/Cu-8Ag/S20C Clad Composite Processed by High Pressure Torsioning (HPT)</b><br>J.Y. Song, J.S. Ha, I.K. Kim and S.I. Hong                                                      | 323 |
| <b>Suitable Hydrogen Pressure Induced Anisotropy in HDDR-Treated Pr-Fe-B Powders</b><br>G.B. Han, S. Fu, M. Liu and R.W. Gao                                                                                  | 328 |