

# Table of Contents

## Preface, Committees and Sponsors

## Chapter 1: Materials Science and Technologies

<b>The Statistical Two-Scale Method for Predicting Viscoelastic Properties of Composites with Consistent Random Distribution of Particles</b> Y. Zhang, Y.F. Nie and Y.T. Wu	3
<b>Growth Processes of AC Powered Micro-Arc Oxidation Ceramic Film on Aluminum Alloy</b> J. Ma	7
<b>Effects on Temperature-Induced Phase Transition of Ni<sub>2</sub>MnGa Polycrystalline Ferromagnetic Shape Memory Alloys</b> Y.P. Zhu, Y.L. Gu and H.G. Liu	12
<b>The Research on Preparation of Binding Material and Concrete with Desulphurization Gypsum</b> P. Tan	17
<b>New Plasma Surface Processing Technology and its Application</b> T.D. Cao and C.Z. Chen	21
<b>Mechanical Properties Affection of Carbon Powder Added into Casting Aluminum Alloy</b> R. Li, Y. Liu and G.M. Zhang	27
<b>Synthesis of Ytterbium-Doped Yttrium Aluminum Garnet Laser Ceramic Nano-Powders by Carbonate Altogether Precipitation Method</b> X.J. Zhang, C. Li, D.X. Huang, Z.F. Lü, Y. Zhang and J.H. Liu	31
<b>The Use of Quasi-Static Indentation Testing to Evaluate Low-Velocity Impact Resistance of <i>Ex Situ</i> Toughened Composite</b> H.M. Dong, X.F. An, X.S. Yi and Z.T. Su	35
<b>Effect of Carbon Content on Microstructure, Mechanical Properties and Wear Resistance of Ti(C,N)-Based Cermets</b> H.L. Wei, H.Y. Lei, G.X. Zhong, H.Z. Yu and P. Feng	41
<b>Research on Effect of Cr<sub>3</sub>C<sub>2</sub> Addition on Microstructure and Mechanical Properties of Ti(C,N)-Based Cermets</b> H.L. Wei, H.Y. Lei, G.X. Zhong, H.Z. Yu and P. Feng	46
<b>Contribution to Study of the Sintering Mechanism</b> W.W. Du and L. Douadji	51
<b>Fatigue Life Prediction of Composite Pin Joints</b> P.G. Mu and X.P. Wan	57
<b>Delamination Analysis in Drilling Carbon Fiber-Reinforced Composites</b> H.F. Wang, H.Z. Li, L.S. Lu, Y.X. Xie and Y. Xiao	62
<b>Effects of Melt Holding Time on as Cast Microstructure and Tensile Properties of Sr-Modified AS31Alloy</b> J.W. Wang, J.X. Zhou, B.C. Ma, S.Q. Tang, F.M. Chu and Y.S. Yang	67
<b>Effect of Artificial Aging on Microstructures and Mechanical Properties of Extruded Mg Alloy ZK60</b> D.L. Yin, J. Qiao and H.L. Cui	72
<b>Study of Epoxy Acrylic Cathodic Electrodeposition Coatings and Investigation on the Electrophoretic Coating Process</b> T.X. Li and F. Chen	76
<b>Fabrication of Stable Superhydrophobic Surface with Low Adhesion on Aluminum Foil</b> Y.M. Xia, Y.F. Zhang, X.Q. Yu and F. Chen	80
<b>On the Characteristics and Corrosion Resistance of Anodic Alumina Films Prepared in Sulfuric Electrolyte with Different Additives</b> X.F. Yang, Y.L. Wang, T.Q. Liang and C.H. Zhao	85
<b>Characterization and Oxidation Behavior of Iron-Based Coatings Prepared by Supersonic Arc Spraying at 800°C</b> T.Q. Liang, X.F. Yang, Y.L. Wang and C.H. Zhao	90

<b>Influence of Heat Treatment Process on the Structures and Properties of Grate Bars Used in Sintering Trolley</b> A.M. Li, D. Ma, Q.F. Zheng, R.H. Chen, Z.J. Huang, Z.J. Zhang and Q. Li	95
<b>Experimental Investigation on the Dynamic Properties and Failure Mode of Carbon Fiber Reinforced Thermoplastic Composites</b> J.H. Ning	102
<b>Preparation and Properties of BMH-PE Antibacterial Films</b> J. Deng, W. Li, X.H. Hao, Z.J. Cao and Q. Xue	109
<b>Fatigue Life Prediction of Composite Laminates under Block Loading</b> Q.H. Ji, P. Zhu, J.H. Lu and C. Zhu	114
<b>Study on Preparation of the Precursor of <math>\text{Sm}_2\text{Fe}_{17}</math> Alloy by Oxalate Co-Precipitation</b> P. Xue and Y. Li	118
<b>Study on Preparation of Metal Sm by Metal Thermal Reduction Method</b> P. Xue	123
<b>Effects of Slurry Fused Ni60 Interlayer on Bond Strength of Cermet Coating to GH202 Substrate</b> J.F. Kou, J. Le and X.C. Sheng	127
<b>Experimental Investigation of In-Plane Mechanical Performance of Carbon/Glass Hybrid Woven Composite</b> J.H. Lu, P. Zhu, Q.H. Ji and Z. Cheng	132
<b>Silver Nanorod Array Electrodes and their Application for Detection of Low Concentration Chloropropanol in Aqueous Media</b> L. Sun, Z.G. Yuan, W.B. Gong, Z.L. Xu, J.J. Lu, Q.H. Zou, Y.Q. Wu and H.F. Wang	136

## **Chapter 2: Applied Mechanics, Design and Manufacturing, Mechanical Engineering, Automation and Control**

<b>Study of Main Propulsion Plant's Mission Reliability in View of Performance Degradation</b> H. Shi, S.L. Yu and J. Deng	143
<b>A Pilot Self-Sustaining Time Delay Safe Switch</b> H.J. Wang and Y.J. Fan	147
<b>The Application of Fuzzy PID Control Algorithm in Variable Frequency Speed Regulation System of Glass Edge Grinding Machine</b> B. Deng and G.Q. Shen	151
<b>Research on Monitoring Fatigue Life of Mechanical Parts Based on Danger Theory</b> Q.H. Meng, S.C. Huang, H.F. Zheng and S.C. Guo	156
<b>Study on the Nonlinear Dynamics of a Single-Stage Gear Vibro-Impact System</b> R.Y. Sheng, Y. Wang and L.N. Zhang	161
<b>Design and Analysis of Transfer System in LED Auto-Insertion Machine</b> J. Yang, Q. Zhang, X.J. Wang and B. Zheng	168
<b>The Comparison of the Variety of Finite Element Method (FEM) Based on the Arm of Mining Excavator</b> H. Zou, M. Zhang and J.J. Ren	173
<b>Numerical Investigation on Thermo Mechanical Behavior in Wet Multidisc Friction Pairs System</b> Z. Hu, M. Han, Z.C. Song and K.Y. Ning	177
<b>Analysis of the Electro-Mechanical Responses of the Piezoelectric Motor Based on Finite Element Method</b> Z.L. Wang and T.D. Qiu	181
<b>Research of Track-Type Full Feeding Combine Harvester Walking Design Scheme Based on Hydraulic Close System</b> X.Y. Lou	187
<b>Vehicle Ride Comfort Simulation Based on Virtual Prototyping Technology</b> B.G. Wu, S.P. Li and S.F. Yan	190
<b>Design of Walking Stepless Speed System for Caterpillar Feeding Combined Harvester</b> X.Y. Lou	194
<b>A Research of Mobile Machinery Based on Closed Hydraulic System</b> X.Y. Lou	198

<b>Finite Element Analysis for Performance of Cap Seal Rings in the Stirling Engine Piston Rod</b>	
J. Chang	202
<b>Sealing Performance Analysis of Cap Seal Rings in the Stirling Engine Piston Rod</b>	
J. Chang	206
<b>Vibration Characteristics and Damage of Turbine Generator Shaft Rubbing</b>	
R.P. Zhang	210
<b>Research on Fuzzy Control of Hydro-Viscous Speed Control System</b>	
L.G. Ma, C.L. Xiang, J.W. Zhang and X. Zhang	214
<b>Measuring Principle of Dynamic Unbalance for Crankshaft</b>	
J. Chang	222
<b>The Tip/Tilp Mirror Modal Analysis Based on Flexible Connection of Equivalent Spring</b>	
C.L. Wang and H.W. Wang	226
<b>Design and Kinematics Analysis of Locust-Like Jumping Mechanism</b>	
Z. Zhen and J. Mi	230
<b>Numerical Simulation of Temperature Field on Different Surface Structure of Bicycle Brake Pairs</b>	
G. Wu, C.C. Huang, H.L. Qin and C.H. Zhao	235
<b>Mill Gear Box of Intelligent Diagnosis Based on Support Vector Machine Parameters Optimization</b>	
X.H. Liu, Y.G. Xu, D.Y. Guo and F. Liu	239
<b>Prediction of Ship Main Engine Exhaust Gas Temperature Using AR Model</b>	
Y.W. Zhang, Y.J. Zou, Z.F. Liu and P. Zhang	244
<b>Design and Debugging of PMSM Control Algorithm for Electric Drive Tracked Vehicle</b>	
X. Feng, Q.Z. Tu, M. Pan, X.C. Zhang and W.J. Zheng	249
<b>Experimental Research of Scuffing of Friction Pair</b>	
J.L. Xu, Z.X. Peng, N. Wang and S.L. Xu	254
<b>Numerical Simulation for Residual Stress of Shot Peening by Finite Element Method</b>	
	258
<b>Research on Energy Management Control Strategy by dSPACE Based Half-Practicality Simulation</b>	
Q.Z. Tu, X.C. Zhang, M. Pan, X. Feng and W.J. Zheng	263
<b>Simulation Research on Motion Reliability of Joystick-Control Mechanism in Excavator</b>	
Q.Z. Tu, W.J. Zheng, M. Pan, X.C. Zhang and X. Feng	267
<b>Development of the Self-Propelled-Gun's External Hydraulic Source</b>	
X.B. Liao, Q.B. Cui, H.Q. Shan and P. Lei	271
<b>Experimental Study of Wheel Rotating Speed Effect on Electrical Discharge Grinding</b>	
B. Hu, C. Lim, S.L. Ding, M.Z. Rahim, M. Brandt and J. Mo	275
<b>Automated Mechanical Transmission Technology and Development Trend</b>	
Q. Chen, Y.C. Zhao, J.B. Yin and Y.B. Ma	280
<b>Research and Design of the Temperature Control System of Crystal Annealing Furnace</b>	
H.Z. Wang, H.R. Yang and H.J. Chang	285
<b>Design of Valve Parametric Variant Template Based on NX</b>	
L.L. Jiao	289
<b>Research on Influencing Factors of Welding Residual Stress of Welded Pipes</b>	
L.Y. Bai, K.B. Jiang, L. Gao and J.Q. Wang	293
<b>Reverse Engineering Design of Vehicle Rear Axle Based on CATIA</b>	
Y.Q. Xia and J. Zhang	298
<b>Research of Design Theory on the Key Components of Transmission System of Electric Vehicle</b>	
R.H. Yang	302
<b>Application of RPM in the Design and Manufacture of Mobile Front Cover</b>	
F. Chen	306
<b>Analysis and Design on a New Garbage Baler</b>	
C.Q. Li and X.B. Zou	310
<b>Analysis of Six Foot Robot Mechanism and Steering Gear in the Desert Environment</b>	
S.J. Jin and F. Yin	314
<b>Research on Tracked Vehicle Passive Power Device Based on Non-Battery Starting</b>	
Y.J. Chen, Z.F. Liu and H.G. Xu	318

<b>Study on the Application of Water Jet Technology in Artillery Maintenance</b> Y.J. Chen, H.G. Xu and Q.S. Gao	322
<b>A Study of Calculation Method for Finger Joint Angular Displacement Based on the Finger Inverse Kinematics</b> S.Y. Qiu, R.B. Yuan, G.Y. Wang, Y.D. Ma, Z.L. Long, L. Wang and Z.J. Zhang	327
<b>Effect of Tractor-Semitrailer Velocity on Cornering Braking Stability</b> C. Li, S.B. Song, G.T. Tang and H.Q. Shi	334
<b>The Progress and Application of Rapid Prototyping Technology</b> Z.W. Zou and X.C. Ye	340
<b>Study on Automated Manual Transmission Fault Diagnosis and Tolerant Control</b> J.B. Yin, Q. Chen, Y.B. Ma and Y.C. Zhao	344
<b>Flow Field Analysis on the Erosion Prone Parts of the Drilling Equipment</b> Q.L. Wang and L.P. Dong	350
<b>A Rapid Measuring Method for Roller Gear Cam Center Distance Error</b> Q.S. Gong, M. Luo and Y.M. Wu	356
<b>Calculation of the Pull-Out Force of Ni<sub>47</sub>Ti<sub>44</sub>Nb<sub>9</sub> Shape Memory Alloy Pipe Coupling</b> J.B. Zhou, K.L. Wang, Q. Chen and G.Y. Wang	360
<b>Optimal Design of Composite Wing-Box by Genetic Algorithm</b> G.R. Pu and P.G. Mu	365
<b>Study of the Effects of Cutting Parameters on Poly-Silicon Nano Machining</b> Y. Zhu, Z. Xiang, L.L. Xie, Y.C. Zhang and J.C. Zhao	369
<b>Research on Evaluation Method of Occupant Neck Injury in Whiplash Test</b> H.M. Gu, L. Lou and C. Chen	373
<b>Computational Modeling of Heat and Mass Transfer during Convection Cooking of Chicken Patties</b> D.G. Zhu, J.R. Chen and M. Li	377
<b>Axial Magnetic Field Distribution Simulation and Optimization in Rotating Magnetron Sputtering System</b> R.F. Zhang, R.C. Wang, J. Cheng and Y.J. Lu	382
<b>Construction of Control Terminal on Intelligent Bus</b> H.X. Zhang and Y. Cui	388
<b>Design of Supervisory System for Bearing Mounting Machine</b> Y.M. Wu, Q.S. Gong, M. Luo and Z.B. Chang	392
<b>Sensorless Speed Control of Permanent-Magnet Synchronous Motor Based on a New Sliding-Mode Observer</b> F.F. Han, Z.H. Wang and T.Y. Han	397
<b>Study on Skid-Steering Drag Force Calculation and Model for Electric Ground Vehicle with Six In-Wheel Motors</b> J.N. Zhi, C.L. Xiang and Y. Ma	402

### **Chapter 3: Monitoring, Information and Communication Technologies**

<b>Research on Multi Point Monitoring System of City Tunnel Sensor Based on D-S Evidence Theory</b> L. Gang	409
<b>Reliability Analysis of a Machining Center</b> K. Fang, M. Luo and Z.C. Chen	415
<b>Application Overview of Neural Network in Fault Diagnosis</b> Z.F. Cai and D.P. Huang	419
<b>A Miniaturized Circularly Polarized Antenna Design for RFID Reader</b> Y.Z. Yu, Y.Y. Wang and Y.R. Chen	425
<b>Leakage Diagnosis Method for Pipelines Based on Multi-Weight Neural Network</b> Z.G. Chen, X.R. Zhong and Y.D. Xie	429
<b>Research of Algorithm and Localization of Robot Based on Image Registration Technology</b> J. Wang and X.H. Ni	434
<b>The Analysis of Storage Efficiency in VMware Virtualization Environment</b> H.H. Zuo and X. Chen	438

<b>Research on Knowledge Coordination Model in Engineering Project Cooperation under the Network Environment</b>	
C.H. Hu and B.F. Liu	442
<b>Analysis of the Knowledge Loss and Knowledge Grid Based on BP Neural Network</b>	
C.H. Hu and B.F. Liu	446
<b>Solving Two-Sided Assembly Line Balancing Problem via Gravitational Search Algorithm</b>	
Y. Wu, Q.H. Tang, L.P. Zhang, Z.X. Li and X.J. Cao	450
<b>Research on Personalized Document Retrieval and Ranking Strategy</b>	
H. Tang and X.C. Zhu	456

## **Chapter 4: Solutions in Industrial Engineering and Management**

<b>Particle Swarm Optimization for Batch Scheduling Problem in Flexible Workshop</b>	
Q. Tang, X.Y. Zhou and J.X. Tang	465
<b>Difference Evolution Algorithm for Batch Scheduling in Chemical Flow Shop</b>	
Q. Tang, P. Liu and J.X. Tang	469
<b>An Approach for Level Scheduling Mixed Models on an Assembly Line in a JIT Production System</b>	
L. Nie, Y.W. Bai, X. Jiang and C.T. Pang	473
<b>Driving Model of Implementing Mass-Customization Manufacturing in Cluster Supply Chain</b>	
C.L. Liu and S.S. Liu	478
<b>Revenue Sharing Contract of Green Supply Chain under Manufacturer Risk-Aversion</b>	
S.Y. Jiang and C.Y. Ma	482
<b>Model and Simulation of the Quality Control System</b>	
G.C. Liu, H.X. Pang and X.F. Xu	488
<b>Current Status and Analysis of the Study on Quality Control</b>	
G.C. Liu, H.X. Pang and X.F. Xu	493
<b>Empirical Study of Credit Rating's Factors Based on the Buyer's Perspective in the Netshop of Small and Micro Enterprises in TianJin</b>	
C.X. Bai	499
<b>Research on the Sustainable Development and the Geological Heritage Protection of Taishan National Geopark</b>	
K. Sheng	504
<b>Integrated Model of Cluster Supply Chain and Logistics Park</b>	
Y.L. Qi and S.S. Liu	508
<b>Optimization and Implementation of the Coating Process for Aoling Vehicles</b>	
H.J. Wang and Y.L. Ma	512
<b>Research on Green Electromechanical Product Design Based on Disassembly</b>	
X.Y. Lou	516
<b>Study on Functional Design of Chemical Disaster Emergency Response Robot</b>	
L.L. Wang and W.P. Zhou	520
<b>Ergonomics Application in Machine Tool Design</b>	
C.Y. Mu and M. Fan	526
<b>Application of BP-ARMA Combined Model Based on Entropy Method in the Prediction of Circle Beam Displacement of Foundation Pit</b>	
Y.B. Hu, F. Shao, Y.X. Huang, Y.W. Liu and J.J. Liang	530