

# Table of Contents

## Preface and Organizing Committees

## Chapter 1 Chemical Engineering and Technology

|                                                                                                                                                  |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Determining the Content of Nitrogen of Water in Lower Yellow River by Isotopic Analysis Method</b>                                            |     |
| J.S. Wu, R.B. Jia, L.L. Wang and C.C. Liu                                                                                                        | 3   |
| <b>Progress of Graphene-Based Composites for Adsorption of Pollutants in Wastewater</b>                                                          |     |
| M. Zhou, L.L. Luo, S.X. Zhong, J.Y. Yang and J.R. Chen                                                                                           | 7   |
| <b>Sintering and Performance of MgO from Bischofite with ZrO<sub>2</sub> Additive</b>                                                            |     |
| Q.Z. Huang, G.M. Lu and J.G. Yu                                                                                                                  | 11  |
| <b>Study on the Fabrication of Degummed Tilapia Fish Scale and its Adsorption of Carmine</b>                                                     |     |
| K.K. Zhu, X. Gong, Y.Y. Luo, B. Li, C.J. Yang, X.T. Peng and Z. Peng                                                                             | 18  |
| <b>Influence of Radionuclides on Farmland Soil and Creek Sediment around a Uranium Mine in the Southwest of China</b>                            |     |
| J.W. Lv, Q.W. Deng and Y. Zhang                                                                                                                  | 23  |
| <b>Study on Earthenware Made by Low-Carbon Catalytic Combustion Furnace of Natural Gas</b>                                                       |     |
| L.Q. Zhu, Z.C. Yu and S.H. Zhang                                                                                                                 | 28  |
| <b>Elution Separation of Polygonum Multiflorum Extract under HPLC Isocratic Elution</b>                                                          |     |
| T. Wang                                                                                                                                          | 33  |
| <b>Influence of SiO<sub>2</sub> Particles on the Defoaming Performance of Silicone Oil Emulsion</b>                                              |     |
| C. Chen, Z.R. Ren and Y.J. He                                                                                                                    | 39  |
| <b>Reactive Adsorption Desulfurization of Thiophene in n-hexane over Oxides Adsorbent of NiO-ZnO/Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub></b> |     |
| X.M. Hou, B.X. Shen and J.G. Zhao                                                                                                                | 43  |
| <b>Preparation of Alumina from NaOH-NaAlO<sub>2</sub>-Na<sub>2</sub>CrO<sub>4</sub>-H<sub>2</sub>O Solutions by Carbonization Process</b>        |     |
| G.Y. Wei, J.K. Qu, P.Y. Zhang, Q. Guo, Y.D. Zheng, T. Qi and Y.H. Li                                                                             | 48  |
| <b>Study of Radiation Damage in Diamond Film Implanted by B Ion</b>                                                                              |     |
| C.X. Yan                                                                                                                                         | 54  |
| <b>Multiscale Investigation on Interfacial Properties of Cu/Al Structures in Electronic Packaging</b>                                            |     |
| L.Q. Zhang, D.J. Liu, L.J. Yu, Y.F. Zhao, X.M. Yuan, J. Liu and P. Yang                                                                          | 60  |
| <b>Phase Structure of (La Mg Nd)<sub>5</sub>Ni<sub>19</sub> Hydrogen Storage Alloy</b>                                                           |     |
| Q. He, Y.Q. Guo and Z.Z. Zheng                                                                                                                   | 66  |
| <b>Constitutive Modeling of Dynamic Recrystallization Behavior of GH80A Superalloy</b>                                                           |     |
| H.K. Wang, L. Zhang, S.D. Gu, Q.H. Quan and W.F. Shen                                                                                            | 71  |
| <b>Synthesis of the Gold-Supported Chitosan-Modified Nanomaterials and Effect of Preparation Conditions</b>                                      |     |
| X.L. Tong, Z.D. Wu, X. Luo, Y.T. Yan and Y.H. Wang                                                                                               | 77  |
| <b>Growth Mechanism of Micro-Arc Spark Deposited Stellite Alloy Coatings</b>                                                                     |     |
| C.H. Zhang, C. Wang, S. Zhang, M.S. Wang, Y.J. Xie and J.Z. Tan                                                                                  | 83  |
| <b>Simulations and Analysis of the Moving Mask UV Lithography for Thick-Photoresist</b>                                                          |     |
| Q. Yu, Z.F. Zhou and H. Zhang                                                                                                                    | 88  |
| <b>Simulation Analysis of Fixed Bed Reactor for Au-Cu Non-Mercury Catalytic Acetylene Hydrochlorination</b>                                      |     |
| L. Wang, B.X. Shen, R.F. Ren and J.G. Zhao                                                                                                       | 94  |
| <b>Synthesis and Visible Light Photocatalytic Activity of Spinel MA<sub>2</sub>O<sub>4</sub> (M=Mg, Zn, Cu)</b>                                  |     |
| Y.Y. Jiang, J.W. Zhang, Z.Q. Hu and J.X. Liu                                                                                                     | 99  |
| <b>Foam Glass for Soiless Cultivation Matrix Prepared by Using Boron Mud</b>                                                                     |     |
| Y.Y. Jiang, Y.N. Li, J.W. Zhang, Q. Yu, Z.Q. Hu and J.X. Liu                                                                                     | 106 |
| <b>Effect of EGCG Application on Collagen Degradation in Dentine Caries</b>                                                                      |     |
| H.Q. Chen and B. Huang                                                                                                                           | 112 |

## Chapter 2 Materials Science and Materials Processing Technology

|                                                                                                                    |     |
|--------------------------------------------------------------------------------------------------------------------|-----|
| <b>Researching of the Active and the Passive Damping of Syntactic Foam and Piezoelectric Composite</b>             |     |
| G.B. Wan, Z.X. Huang, M.X. Shi, K. Huang and Z.R. Chen                                                             | 119 |
| <b>Numerical Simulation on the Blanking of Metal Tubes</b>                                                         |     |
| Y.P. Yu, Q.H. Yang and M.J. Hu                                                                                     | 123 |
| <b>Thermodynamic Properties of Wurtzite and Zinc-Blende AlN</b>                                                    |     |
| X.M. Cai, J.M. Wang and Q.N. Zhou                                                                                  | 127 |
| <b>Research on Cu-Cr Alloy Produced by Equal Channel Angular Pressing</b>                                          |     |
| X.Q. Zhang, G. Chen and X.N. Chen                                                                                  | 131 |
| <b>Multi-band Terahertz Chiral Metamaterials Based on Complementary Cross-wire Structure</b>                       |     |
| P. Zhang, Z.Z. Cheng and H.X. Cao                                                                                  | 137 |
| <b>Experimental Study on Abrasion Resistance of Grinding Rolls with Stripes Surface</b>                            |     |
| Y.C. Qi, Y.J. Xu, Q.B. Wang, F.M. Teng, Q. Cong and J.F. Jin                                                       | 142 |
| <b>Structural, Magnetic and Electrical Transport Properties of Ternary Compound LaCo<sub>2</sub>Ge<sub>2</sub></b> |     |
| H.Y. Liu, L. Fu and Y.Q. Guo                                                                                       | 148 |
| <b>The Aluminum Brazing Pieces of Mechanical Performance Based on GRNN Neural Network</b>                          |     |
| X.H. Liang, L. Shi, Y.S. Liu and X.M. Hua                                                                          | 154 |
| <b>Serrated Flow in 316LN Austenitic Stainless Steel</b>                                                           |     |
| Z.Q. Xu and Y.Z. Shen                                                                                              | 159 |
| <b>The Numerical Simulation of Transverse Tensile of High Temperature on Ti-6Al-4V Laser Butt Weld Joint</b>       |     |
| Y.P. Chen, Z. Fan, D.H. Cheng and D. Hu                                                                            | 163 |
| <b>Design and Simulation of a Polarization-Independent Active Metamaterial Terahertz Modulator</b>                 |     |
| L.S. Feng, B.H. Yin, Z. Zhou, J.W. Sui and C.L. Li                                                                 | 167 |
| <b>Forming Performance of 800MPa Grade Advanced High Strength Steels</b>                                           |     |
| M. Zhang, Y.X. Ning, J. Zhang, Z. Wan and T. Wang                                                                  | 173 |
| <b>Effect of Heat Treatment on the Microstructure and Hardness of X38CrMo16 Steel</b>                              |     |
| M. Wu, Y.P. Zeng and W. Yang                                                                                       | 179 |
| <b>Arc Welding Working Hours Based on MODAPTS</b>                                                                  |     |
| Z.Q. Ma, T. Wang, D.Y. Wang, L. Sun, Q. Cheng and J. Wei                                                           | 185 |

## Chapter 3 Applied Mechanics

|                                                                                                                                             |     |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Research on Subjective and Objective Evaluation of Car Interior Sound Quality</b>                                                        |     |
| T. Zhuang and Y.Y. Zuo                                                                                                                      | 193 |
| <b>A New Shear Deformation Theory for Free Vibration of Functionally Graded Beams</b>                                                       |     |
| S. Xiang                                                                                                                                    | 198 |
| <b>Finite Element Analysis on Frame of Rice Transplanting Mechanism at Different Operation Conditions</b>                                   |     |
| C.L. Mo, W. Guan, G.Y. Huang, Y.J. Lu and W. Zhong                                                                                          | 202 |
| <b>Analysis of Carrying Capacity and Friction Torque of Friction Pair Fluid-Film for High Parameter Bellows Mechanical Seal</b>             |     |
| M. Ahmat, Z.W. Niu and G. Abudoumijiti                                                                                                      | 207 |
| <b>The Study on Thermal Interaction of the Underground Water Source Heat Pump's Different Pumping/Injecting Well Groups' Arranged Modes</b> |     |
| S.M. Zhang and Q. Gao                                                                                                                       | 212 |
| <b>Analysis of Concrete Water Cellar Structure in Qingshuihe County, Inner Mongolia, China</b>                                              |     |
| F. Zhou, S.R. Li, J.D. Huo, H.T. Peng, Z.H. Li and X.P. Zhang                                                                               | 216 |
| <b>Analysis on Aerostatic Response for Hongkong-Zhuhai-Macao Great Bridge in Construction Stage</b>                                         |     |
| Y. Li, S. Wang and Y.Y. Che                                                                                                                 | 220 |

|                                                                                                                                                                |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Improved Seismic Checking for Pier Based on Seismic Energy Response Method</b><br>Y. Li, Y.Y. Che and S. Wang                                               | 224 |
| <b>Finite Element Analysis on Drilling of Unidirectional Carbon Fiber Reinforced Plastic (CFRP)</b><br>Y.L. He, G.P. Zhang and J.P. Xue                        | 228 |
| <b>The Analysis of Torsional Vibration of Coiler Drive System</b><br>X.W. Sun and H.B. Yang                                                                    | 232 |
| <b>Effect of Acceleration Pulse Shape on Damage of the Specimen under Hopkinson High-g Loading</b><br>W. Liu, R.Q. Shen, X.X. Sun and Y.H. Ye                  | 236 |
| <b>Numerical Simulation of Labyrinth Screw Pump with Separated Structure by Fluent</b><br>J.J. Li and Y.C. Zhang                                               | 242 |
| <b>Dynamic Characteristics Analysis of the Mud Transfer Pump Rotor</b><br>J.Y. Sun and J.M. Xiao                                                               | 248 |
| <b>The Sensitivity of the Focused Ultrasonic Method Used in Inclusion Testing of the Thick Steel Specimen</b><br>G.X. Zhang, Y.S. Hua, Y.W. Shen and H.W. Yang | 253 |
| <b>Research on Curvature Mode Characteristics of Damaged Simply Supported Beam</b><br>X. Shang, Y. Xu and G.F. Ren                                             | 261 |
| <b>The Non-Probabilistic Reliability Analysis of Stayed-Cable Based on the Interval Algorithm</b><br>S.S. Cao, J.Q. Lei and K. Zhang                           | 267 |
| <b>Dynamic Adjusting Mechanism of Counterbalance in Beam-Pumping Unit and its Kinetic Analysis</b><br>X.Q. Kang, T. Ren and W.T. Qu                            | 274 |
| <b>Impact Deformation Model of Thin-Walled Shell Filled with Explosive under High Axial Shock Overload</b><br>X.X. Sun, W. Liu, R.Q. Shen, Y.H. Ye and L.Z. Wu | 279 |
| <b>Study on Working Performances and Factor Combinations of ASU</b><br>C.J. Zhou, W. Wang, Y. Ge and Y. Ma                                                     | 286 |
| <b>CFD Numerical Simulation of Aeolian Vibration of Single Conductor Based on the ADINA</b><br>Y.P. Xia, X.M. Rui, L. Yang, D.D. Wang and J.Y. Liang           | 292 |
| <b>Studies on Static Temperature Compensation for Vibrating Beam Accelerometer</b><br>L.S. Feng, H. Wang, Z. Zhou and G.L. Yang                                | 298 |
| <b>Mechanical Analysis and Modeling for Tricopter</b><br>Y. Yang, L.L. Xiang, Z. Liu and J.F. Cui                                                              | 304 |
| <b>Random Vibration Analysis and Structural Modification of Satellite-Borne Equipment</b><br>E.M. He, G.L. Yin and Y.Q. Hu                                     | 310 |
| <b>Load Identification of Aircraft Airfoil</b><br>Z.G. Wang                                                                                                    | 314 |
| <b>Stability of Restricted Homological Dimensions</b><br>D.J. Wu                                                                                               | 320 |
| <b>Numerical Calculation Method and Study for Frost Heave Deformation of Ground Heat Exchanger Pipe</b><br>X.L. Zhu, Q. Gao, M. Yu and Y.T. Wang               | 325 |
| <b>Transient Heat Transfer Analysis of a Micro Heat Exchanger</b><br>Z. Qian and H.M. Wang                                                                     | 330 |

## **Chapter 4Control, Automation and Information Technologies**

|                                                                                                                                                    |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Feedback Control of Parabolic Distributed Parameter Systems</b><br>H.L. Xing and W.S. Cui                                                       | 337 |
| <b>A Human Target Detection and Tracking Method Based on Adaptive Difference and GVF-Snake Algorithm</b><br>X. Zhang, W.C. Xie, C. Huang and Q. Xu | 344 |
| <b>Application of Low-Voltage Carrier Meter Reading System in the Electricity Network Management</b><br>J.H. Jiang and X.H. Yang                   | 350 |

|                                                                                                                                                                          |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Dimensional Synthesis of 3PRS Parallel Mechanism Based on a Dimensionally Homogeneous Analytical Jacobian</b><br>Y.G. Li, L.X. Xu and H. Wang                         | 354 |
| <b>Inverse Dynamics Formulation and Analysis of a Parallel Manipulator with 3DOFs Based on the Virtual Work Principle</b><br>Y.G. Li, L.X. Xu and H. Wang                | 360 |
| <b>System Identification of Underwater Vehicles with ML Algorithm</b><br>J.G. Wang, G.Y. Hu and C.M. Jiang                                                               | 366 |
| <b>A Design of Short Range Wireless Communication Module Based on nRF24L01</b><br>X.H. Kuang and S.M. Wang                                                               | 372 |
| <b>Research of Gear Shift Control Technology for a New 8-Step Speed Automatic Transmission</b><br>Y. Liu, S.H. Wang, X. Lu, T.B. Song, W.S. Wei and X.Y. Xu              | 376 |
| <b>Numerical Simulation of Synthetic Jet Actuator and its Controlling Effect on the S-Inlet</b><br>Y.Q. Hu, N.M. Wu and H. Liu                                           | 383 |
| <b>The Robot Wrist Sensor Dynamic Mode Building Method Based on Genetic Wavelet Neural Networks</b><br>A.L. Yu and J.Q. Dai                                              | 389 |
| <b>Study on Fault-Tolerant Control Scheme for a Helicopter via Adaptive <math>H^\infty</math> Control</b><br>X. Chen, F.Y. Chen and B. Jiang                             | 395 |
| <b>Intelligent Automation and Control Technology Based on Energy Meter Testing and Storage System Construction Model</b><br>H.L. Shao, Z.Q. He, E.Q. Xu and L. Liu       | 402 |
| <b>The Realization of Serial Communication in Temperature Control Instrumentation</b><br>J.C. Chen, J.Y. Li, M. Yang and J. Li                                           | 408 |
| <b>Analysis for Impacts of Detection Error Rates on Optimal Decisions of Closed-Loop Logistics Network</b><br>M. Zou and Q.L. Gu                                         | 414 |
| <b>Calculation of Nodes and the Application of CNC Welding Machine by Equal-Error Method to Approach Plane Curve of Cam Contour with Helix</b><br>X.H. Dong and G.Y. Tao | 420 |
| <b>GTAW Procedure Expert System Based on Neural Network</b><br>X.W. Wang and S.Y. Yang                                                                                   | 425 |
| <b>Metrorail Train Safety Monitoring Central Node Network Computing Environment</b><br>H.F. Hong, Z.C. Chang, C.H. Yang and X.D. Wang                                    | 431 |
| <b>Implementing Master-Slave P2P Mapping Paradigm in Semantic Enterprise Information Integration: An Illustrative Case Study</b><br>J.T. Zhou                            | 434 |
| <b>Dynamic Maintenance Data Mining of Traffic Sign Based on Mobile Mapping System</b><br>D. Li and W.Y. Su                                                               | 438 |
| <b>Experimental Study on the Stress of Ferromagnetic Tensile Specimen Using Magnetic Barkhausen Noise Detection</b><br>T.Y. Ren, G.L. Chen, W.M. Zhang and Z.C. Qiu      | 442 |
| <b>Detection Resolution of Acoustic Microscopy in Micro-Scale</b><br>K. Peng, C.G. Xu, X.H. Guo and D.G. Xiao                                                            | 448 |
| <b>The Study of Acceleration Effect for Piezoresistive Micro Pressure Sensor</b><br>B. Tian, Y.L. Zhao and Z. Niu                                                        | 455 |
| <b>Methodology for Measurement of the Blue Light Hazard of Light-Emitting Diodes with Imaging Luminance Meter</b><br>J. Liu, X.B. Zhuang, H. Yao and S.D. Zhang          | 460 |
| <b>Investigation of On-Chip Hot Spot Cooling Using Microchannel Heat Sink</b><br>Y.C. Wu, S.L. Xu and C. Wang                                                            | 466 |
| <b>Numerical Study of Pulsating Flow Frequency and Heat Transfer in Porous Channel Heat Sink</b><br>C. Wang, S.L. Xu and Y.C. Wu                                         | 470 |
| <b>In Modulating Ferroelectric Uncooled Infrared Focal Plane Detector</b><br>F.Y. Deng, X.S. Wu and Y.F. Li                                                              | 474 |
| <b>Methodology for Development of a Virtual Instrument</b><br>X.D. Jing and B.S. Xu                                                                                      | 480 |

|                                                                                                                                                      |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Research on Resistivity Measurement System of Submarine Sediment</b><br>L.J. Wu, B. Ma and Y.H. Yang                                              | 486 |
| <b>Development of End of Line CAN Bus Test System in Electric Vehicles Based on LabVIEW</b><br>J.R. Nan, L. He, C. Lin and C. Sun                    | 491 |
| <b>Design of the Wire Rope Cleaning and Detection Line Control System Based on Touch Screen and PLC</b><br>Y.F. Gao, G.P. Li, C.D. Jiang and Y.J. Li | 495 |

## **Chapter 5 Design and Manufacturing**

|                                                                                                                                                                                                     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Research on Precision Detection and Error Compensation Technology for 3-Axis CNC Milling Machine</b><br>H.H. Xu and C. Dai                                                                       | 505 |
| <b>Simulation Analysis of Matrix Cone Angle in Ironing Stretch Technology of Two-Piece Can</b><br>H.B. Li, Y.W. Yuan, J. Zhang, X.J. Chai, B.S. Wang and L.G. Kong                                  | 511 |
| <b>The Optimal Design of Cold Extrusion Die and its Realization</b><br>Y. Cheng and L.W. Zhang                                                                                                      | 517 |
| <b>The Design of the Mini-Type Handling Machine for Crops</b><br>Y.H. Chen and Z.F. Liu                                                                                                             | 522 |
| <b>Method of Measurement System Analysis Techniques in the Manufacturing Quality Analysis</b><br>H.Z. Wu, X.T. Pan, J.W. Cai and M.F. Zhang                                                         | 527 |
| <b>3D Modeling and Closed-Form Inverse Kinematics Solution for 6dof Surgical Robot</b><br>E. Farah and S.G. Liu                                                                                     | 533 |
| <b>Experimental Study on the Effect of Density of EPS Buffer Layer on the Cushioning Property of Motorcycle Helmet</b><br>W.C. Wen and D.M. Fu                                                      | 539 |
| <b>Analysis and Optimization of Marine Pumps Take-Off and Landing Platform Based on ANSYS</b><br>C.Q. Zhou, J. Yu, D. Shen, Z.P. Xia and P. Liao                                                    | 544 |
| <b>An Intelligent Winch Rope-Aligning System</b><br>L.J. Wu, J.G. Jiang, X.B. Li and L. Huang                                                                                                       | 551 |
| <b>Residual Analysis in Inverse Identification of Total Thrust on Shield Tunneling Machine</b><br>K. Chen, Z. Zheng and Q. Zhang                                                                    | 557 |
| <b>Process Route Optimization for Machining Center NC Milling Manufacturing</b><br>Z.Q. Ma, P. Zhang, M. Gu, L. Sun, X.L. Sun, Q. Cheng and J. Wei                                                  | 561 |
| <b>Experimental Research in Wind Tunnel of Aerodynamic Characters for New-Type Energy-Saving Conductor</b><br>X.M. Li, K.J. Zhu and B. Liu                                                          | 568 |
| <b>Degradation Mode Recognition for Battery of Electric Vehicle Based on ART2 Network</b><br>G. Yu and M.M. Guo                                                                                     | 574 |
| <b>Development of a CAD/CAPP Integrated System for Metal Bellows Expansion Joints</b><br>Y.F. Zhang and A.C. Wang                                                                                   | 580 |
| <b>Design of Shipborne Reducer Box Damping in Reducing Vibration</b><br>W.S. Li and P. Lu                                                                                                           | 585 |
| <b>Reeved Tooling Design and Finite Element Analysis on Stators of a 400MW Generator</b><br>S.J. Xin                                                                                                | 593 |
| <b>3D Design and Performance Analysis of Weft Insertion Mechanism of Carbon Fiber Multi-Layer Loom</b><br>D.D. Li, J.C. Yang, H.Q. Wang, K. Yang, J.F. Qin, Y. Bai, S.H. Hu and X.M. Jiang          | 598 |
| <b>Design and Analysis of the Weft Accumulator of the Angle Interlocking Multilayer Loom of Carbon Fiber</b><br>Y. Bai, J.C. Yang, Q. Zhang, H.Q. Wang, J.F. Qin, K. Yang, S.H. Hu and X.M. Jiang   | 604 |
| <b>Design and Analysis of the Traction Mechanism of the Angle Interlocking Multilayer Loom of Carbon Fiber</b><br>Y. Bai, J.C. Yang, Q. Zhang, H.Q. Wang, K. Yang, J.F. Qin, S.H. Hu and X.M. Jiang | 609 |
| <b>Process Management Evaluation on Machinery Manufacturing Enterprises</b><br>L. Lv, Y.T. Song and S.F. Zhang                                                                                      | 615 |

|                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| <b>An Improved Production Scheduling Algorithm Based on Resource Constraints</b><br>Y. Gao, X. Zhang and J.Z. Xu | 619 |
| <b>Design of the Solar Automatic Tracker of Polar Axis Type</b><br>D. Ning, N. Yao, L.F. Song and H.X. Wang      | 625 |