## **Table of Contents**

## **Preface and Organization**

Chapter 1: Flow Measurement and Pneumatic Conveying	
Test Procedures and Signal Misinterpretation for Electrostatic Gas-Solids Flowmeters J. Coulthard, R. Cheng, J.Y. Zhang and R.P. Keech	1
High Speed Visualization of Pneumatic Conveying of Materials in Bypass System M.G. Jones, B. Chen, K.C. Williams, A. Abu Cenna and Y. Wang	6
<b>Experimental Investigation of Pressure Drop in Bypass Pneumatic Conveying of Fly Ash</b> B. Chen, K.C. Williams, M.G. Jones and Y. Wang	11
Investigation of Flow Channel Geometry and Draw-Down in Funnel-Flow Bins and Stockpiles Y.Y. He, A.W. Roberts and J.D. Prigge	16
Research of Gas/Solid Two-Phase Flow Capacitance Cross-Correlation Measurement	
System W.T. Li, X.G. Yue and R. Zhang	21
Flow Characteristics of Gas-Solid Two-Phase Flow in Annular Pipe of Gas Drilling J. Zhao, S.G. Hu, P.W. Wang and C. Wu	25
<b>Application of Grey Correlation Degree in Identification of Two-Phase Flow Patterns</b> X.J. Wu, S. Liu, B. Li and C. Xu	29
Chapter 2: Measurement of Size, Volume and other Parameters	
Particle Size Analysis by Laser Diffraction Method Using Reference Particles Y. Mori, H. Yoshida and H. Masuda	33
Characteristics of Dry Ice Particles Produced by Expanding Liquid Carbon Dioxide and its Application for Surface Cleaning Y.H. Liu and S. Matsusaka	38
Volume Measurement of Large Material Stack Based on the RBFNN Interpolation C. Chen, W.M. Yang and P.X. Zhang	43
Uncertainty Evaluation in Measure Results of Rock Permeability Y. Chen	47
Macrograph Grain Size Analysis Method of Tight Gravel-Rock Huang Lina L.N. Huang	51
Measurement on the Shear Property Parameters of the Eruption Powder J.Q. Li, X.J. Li, H. Li, S.H. Du and S.C. Fan	55
Study on Petrophysical Parameters Testing Technology for Loose Rock J.S. Qi, M.J. Yang and Y. Liu	59
Grain Gradation Design for Al <sub>2</sub> O <sub>3</sub> -MgO-C Refractories Based on Close Packing Theories S.M. Zhao, W. Yang, J. Sun and Z. Xie	63
A Combined Interpolation Method for Cross Correlation Based Particle Velocity Measurement	
G. Yang, W.D. Li, Y.T. Wang and M.Y. Li	67
Chapter 3:Tomographic Technology, Image Processing and Related Sensors	
A Novel Approach to Multiphase Flow Metering Using PIV and Tracer Dilution C.A. Uleh, J.Y. Zhang, D.L. Xu and I. French	71
Process Tomographic Measurements of Granular Flow in a Pneumatic Conveying System J. Yao, E.W. Chuan Lim, C.H. Wang and N. Li	75
Image Reconstruction Based on Compressed Sensing with Split Bregman Algorithm and Fuzzy Bases	
J.J. Čui, X. Jia, J. Liu and Q. Li	80

A	
Array D.C. Lu, F.Q. Shao and Y.X. Cao	84
Research on Human ADL Data Real-Time Transmission Optimization Method Based on	
Bayesian Network Y. Sun	88
Optimization Design of Capacitance Sensor with Helical Shaped Surface Plates	
Y.T. Wang, J.F. Yuan, G. Yang and Y.F. Qiao	92
An Image Quality Assessment Algorithm for Palm-Dorsa Vein Based on Multi-Feature Fusion	
J.J. Cui, Q. Li and X. Jia	96
Chapter 4:Powder Explosion and System Protection	
Assessing the Explosion Risk of Plants for Dusty, Granular and Combustible Products Example of a Risk Assessment Procedure for a Fluid Bed Spray Granulator	
S. Radandt	101
Experiment and Analysis of Large Energy Spark Discharge X.G. Li, S.J. Zhong, C.L. Ren, L. Lu, Y. Cheng and X.M. Feng	106
Comparison and Analysis of Different Standards for Determining Dust Resistivity	100
X. Jin, S.J. Zhong and W.Y. Li	110
Determination of Kinetic Parameters of Maize Starch in Air Using Thermogravimetric Analysis	
C.M. Yuan, C. Li, G. Li and P.H. Zhang	114
Modeling of Magnesium Powders Explosion in a 20L Sphere	110
C.M. Yuan, C. Li, G. Li and P.H. Zhang  A Study on Explosion Characteristics of Toner Powder	118
X.L. Li, L. Fan, H.Y. Xie and J.W. Wang	122
New Findings for Explosion Protection of Bucket Elevators by Design Measures	127
A. Vogl and S. Radandt	127
<b>Chapter 5:New Instruments and Sensors Development</b>	
The Investigation of Arch Model Acting in Mass-Flow Hoppers	
J. Guo, A.W. Roberts and J.D. Prigge	135
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching	
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching  X.J. Ding, L.L. Liu and M.S.A. Bradley	135 141
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching  X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process  Z. Tian, N.C. Bing and H.Y. Xie	
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching  X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process  Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument	141 146
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching  X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process  Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument  H.C. Bai, H.J. Meng and Z. Xie	141
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda	141 146
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres	141 146 151 155
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda	141 146 151
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument	141 146 151 155 160
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao	141 146 151 155
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of Gas-Solid Two-Phase Flow	141 146 151 155 160
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of	141 146 151 155 160
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of Gas-Solid Two-Phase Flow Z.C. Wang, W.J. Zhang and W.T. Li	141 146 151 155 160
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of Gas-Solid Two-Phase Flow	141 146 151 155 160
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of Gas-Solid Two-Phase Flow Z.C. Wang, W.J. Zhang and W.T. Li  Chapter 6:Nano and Powder Materials Preparation  Population Balance Modelling and Experimental Validation for Synthesis of TiO <sub>2</sub> Nanoparticles Using Continuous Hydrothermal Process	141 146 151 155 160 166
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of Gas-Solid Two-Phase Flow Z.C. Wang, W.J. Zhang and W.T. Li  Chapter 6:Nano and Powder Materials Preparation  Population Balance Modelling and Experimental Validation for Synthesis of TiO <sub>2</sub> Nanoparticles Using Continuous Hydrothermal Process M. Chen, C.Y. Ma, T. Mahmud, T. Lin and X.Z. Wang	141 146 151 155 160
J. Guo, A.W. Roberts and J.D. Prigge  New Instrument PFT for Powder Flow Researching X.J. Ding, L.L. Liu and M.S.A. Bradley  High-Resolution Ultrasonic Spectroscopy for Crystallization Process Z. Tian, N.C. Bing and H.Y. Xie  Development of an Embedded High-Temperature Field Measuring Instrument H.C. Bai, H.J. Meng and Z. Xie  Segregation Diagram of a Mixture of Particles with Different Sizes and Densities S. Shimamura, T. Takahira, S. Suga, H. Tamura and Y. Senda  Deformation Modes for Assemblies of Frictionless Polydisperse Spheres N. Kumar, O.I. Imole, V. Magnanimo and S. Luding  Design and Application of Virtual Instrument Detection System for Aerodynamic Instrument P. Zhang, K. Li, X.S. Sun and X.W. Gao  Simulation Study of Spiral Electrode Capacitance Sensor for Measuring Concentration of Gas-Solid Two-Phase Flow Z.C. Wang, W.J. Zhang and W.T. Li  Chapter 6:Nano and Powder Materials Preparation  Population Balance Modelling and Experimental Validation for Synthesis of TiO <sub>2</sub> Nanoparticles Using Continuous Hydrothermal Process	141 146 151 155 160 166 170

<b>Preparation of Super-Fine Cerium Oxide Using Mechanically Chemical Method</b> Z.Y. Gu, H.Y. Gu, X.K. Peng and Y.X. Li	184
Preparation of Nano-Sized TiO <sub>2</sub> Supported on Granular Activated Carbon and the Photocatalytic Degradation of Methylene Blue P. Zhang, S.T. Lai, F. Liu, Z.H. Yang and W.Y. Zhou	188
A Study on Grinding Rate of Mica Particles H.Y. Xie, H. Yuan and J. Guan	192
Environmental Risk and Recoverable Potential Evaluation of Heavy Metals in the Sludge from the Industrial Wastewater in China	192
J.F. Bai, C.L. Zhang, J.W. Wang, J.Q. Xu, Y. Zhou and W.J. Wu	196
Modification of Sepiolite and its Ability to Remove Heavy Metals Z.P. Chen, Y. Wang and H.Y. Gu	200
Operation Efficiency Evaluation on Small and Medium-Sized Powder Metallurgy Enterprise Cluster Supply Chain	
G.F. Li and J. Guan	203
Chapter 7:Materials Processing and Preparation	
Control and Characterization of Materials Recovered from Mechanical Recycling of Waste Refrigerators	
F. La Marca Investigation into Hydrolysis of Alkaline Sodium Borohydride Solution Using Attapulgite	207
Clay-Supported Co-B-Ce Catalyst H.J. Tian, Q.J. Guo and J.S. Zhang	212
<b>Design of Supervisory Control and Data Acquisition (SCADA) Platform for TE Process</b> J.W. Huang	216
<b>Direct Synthesis and Characterization of Ti-SBA-15 with Different Ti Precursors</b> S.W. Chen, M.M. Qin, H.F. Yang and H.Y. Xie	220
Influence of Operating Parameters on Photocatalytic Degradation of Methylene Blue in UV/ Tb <sup>3+</sup> and Sm <sup>3+</sup> Co-Doped TiO <sub>2</sub> Process X.D. Lu and C.Z. Jiang	224
Microbial Leaching of Copper from Waste Electronic Scraps J.Q. Xu, J.F. Bai, J.W. Wang, B. Liang, H. Cheng, J. Guan and L.J. Wang	228
Prediction on Molten Steel End Temperature during Tapping in BOF Based on LS-SVM and PSO	
W. Yang, H.J. Meng, Y.J. Huang and Z. Xie	233
Controllable Imprinted Polymer Layer Coated Silica-Gel for S-1-(1-Naphthyl) Ethylamine Recognition by ATRP	
N.C. Bing, X.R. Zhu, Z. Tian, H.Y. Xie and L.J. Wang	237
<b>Chapter 8: Powder Materials Measurement and Processing</b>	
Study on the Pressure-Sinkage Relationship of Lunar Soil Simulant J.Q. Li, H. Li, D.W. Jin, L. He and M. Zou	241
Growth of Ceramic Coatings on LY12 Aluminum Alloys by Micro-Arc Oxidation and Microstructure Properties of Ceramic Coatings J.L. Gao, Z.C. Shao and T.Z. Li	246
Scanning Probe Microscope Observation to Morphology of Typical Carbon Materials X.R. Zhu, J.F. Wang and J. Li	250
Experimental Study on Flow Field Characteristic of Bag Filter H.M. Fu and Y.J. Zhao	254
Photocatalytic Activity of Gd <sup>3+</sup> and Sm <sup>3+</sup> Co-Doped BiVO <sub>4</sub> Powders Prepared by Chemical Precipitation Process	
C.Z. Jiang, R. Yang, S. Bai and X.D. Lu	259
Velocity Measurement for Flow Particles by Using Spatial Filtering Technique Based on Sensor Array Z.X. Lu, G. Yang and Z.S. Wang	263
Effects of Quenching Heat Preserving Time on Structure and Properties of Boron-	203
Containing High-Cr White Cast Iron C.L. Zhang and Q.B. Xin	267

Research of Corner Detection Algorithm with Stack Volume Measurement P.X. Zhang, W.M. Yang and C. Chen	271
Modified Board System for Ecological Monitoring of Ground-Based Objects State L.R. Bekirova	275