Chemical, Mechanical and Materials Engineering II

Selected, peer reviewed papers from the 2013 2nd International Conference on Chemical, Mechanical and Materials Engineering (CMME 2013)

Applied Mechanics and Materials, Volume 319

Melbourne, Australia 20-21 January 2013

Editors:

Jun Zhang

Qi Luo

ISBN: 978-1-62748-850-1

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2013) by Trans Tech Publications Ltd. All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact Trans Tech Publications Ltd. at the address below.

Trans Tech Publications Ltd. Laubisrutisr 24 CH-8712 Stafa-Zuerich Switzerland

Fax: +41 (44) 922 10 33 Fax: +1 (603) 632-5611

e-mail: sales@ttp.net

Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA

Phone: 845-758-0400 Fax: 845-758-2634

Email: curran@proceedings.com Web: www.proceedings.com

Table of Contents

Preface and Organizing Committee

Chapter 1: Material Engineering and Technology

Crystal Structure and Luminescence of SrAl ₂ O ₄ : Eu ²⁺ ,Dy ³⁺ Phosphor Prepared by Nano-Pseudoboehmite Particulate Peptizing Method F.L. Zhu and Y.S. Meng	3
Study of Electrical and Aging Properties on the La-Doped Aurivillius Phase Ferroelectrics BaBi ₄ Ti ₄ O ₁₅ B.W. Yu, Q.Q. Zheng, L.J. Pan, D.H. Zhang, Y.X. Tang and D.Z. Sun	9
Kinetics of Atmospheric Acid Leaching of a Limonitic Laterite	9
K. Liu and X. Liu	14
Melting Temperature of MgO under Pressure S. Zhang and L. Chen	19
Distribution and Intensity of the Built-in Field in Poled Silica Thermally Based on a Junction Model	
Y.T. Ren, Z.Q. Dai, J. Wang and J.Y. Duan	23
Preparation and Sizing Application of ASA\Liquid Paraffin Stabilized by Grafted Montmorillonite	20
D.H. Yu, Z.Y. Lin and Y.M. Li Microstructure and Oxidation Resistance of Muscovite-Glass Frits Loaded High Silica	29
Cloth/Boron-Containing Phenol-Formaldehyde Resin-Based Ceramifying Composites Y. Qin, J. Ding, Z.X. Huang, Q.L. Mei and Z.L. Rao	34
Catalytic Spectrophotometric Determination of Trace H ₂ O ₂ Using Fe ₃ O ₄ Nanoparticles as	
Peroxidase Mimetics H.X. Ouyang, A.H. Liang, J.N. Tian and Z.L. Jiang	39
Ultrafast Response Humidity Sensor Based on Electrospun Porous BaTiO ₃ Nanofibers H.D. Zhang, C.H. Sheng, B. Sun and Y.Z. Long	43
Dependence of Thermodynamic and Optical Properties on Glass Compositions in Low- Phonon Energy Heavy-Metal Gallate Glass System X.Z. Han, F. Wang, X. Zhao, T.C. Ma, Z.Q. Wang and H. Lin	49
Evaluation of Properties of FIB Deposited Metal Layer and Application to Temperature	7/
Sensing D.K. Choi and S.H. Lee	54
High Hydrophilic Poly(Ethylene Terephthalate)(PET) Fabric Modified by Ionic Agent F. Xu, G.X. Zhang, F.X. Zhang and D.Y. Wu	58
Physical Properties of High-Temperature Liquid Furnace Slags W.J. Feng, C.Y. Wang, Z.G. Zhang and W. Zheng	62
A Durable Superhydrophilic Modification of Polyester Fabric	
G.X. Zhang, F. Xu, W. Hu and F.X. Zhang	66
Chapter 2: Material Processing and Machining, Surface and Coating Technologies	
Study on the Properties of CrN Coating Prepared on 3Cr2W8V by Electron Beam Surface Alloying Process	
Y.F. Chen, H.B. Xu, J.J. Hu and L. Chun	73
Wear Mechanism of Si ₃ N ₄ /TiC Micro-Nano-Composite Ceramic Tool in Dry Machining of Nodular Cast Iron Z.J. Lü, M.F. Ding and J. Zhao	79
Optical Properties of Electrodeposited Alumina Thin Films by Using Spectroscopic	
Ellipsometer M. Farzana, R. Saira and N. Shahzad	84

Weakly Nonlinear Stability Analysis of a Thin Power-Law Fluid during Spin Coating M.C. Lin, C.I. Chen and S.J. Huang	90
Surface Modification of SKD 61 by Electrical Discharge Coating (EDM/EDC) with Multilayer Cylindrical Electrode and Jatropha Curcas as Dielectric Fluid D. Priadi and W.E.S. Siradj	96
Application of Plasma Technology in Surface Modification of Carbon Materials L. Hui, S.F. Kong, Y.S. Liu and H. Zeng	102
Improvement of Surface Figure in the Polyurethane Pad Continuous Polishing Process D.F. Liao, H. Zhao, Z.G. Yuan and R.Q. Xie	107
Chapter 3: Bio-, Chemical and Medical Engineering and Technologies	
Histological Study of the Toxic Effects of Solder Fumes on Spermatogenesis in Rats M.R. Arab and M.H. Heidari	115
Gene Polymorphism and Susceptibility to Brucellosis Y.J. Huang, W.L. Jin, Q. Yan and A.M. Ma	121
Microwave Induced Pyrolysis of Biomass K.Q. Shi, T. Wu, H.T. Zhao, E. Lester, P. Hall and Y.D. Wang	127
pH-Effect on Sinterability, Mechanical Properties and Cytotoxicity of Hydroxyapatite-Based Bone Grafts M. Demirel, B. Aksakal and N. Basak	134
Fusion, Expression and Identification on the mpb51 and mpb63 Genes of Mycobacterium bovis	
Y.H. Gao, C.F. Wang, X.Y. Jiang, H.X. Ma, D.M. Gao, Y.R. Zheng, J.N. Guan, J.M. Lin, S. Hou, L. Liu, B.J. Li, L.L. Li and F. Ren	140
Prokaryotic Expression and Identication on the 20kDa Protein Gene of Mycobacterium paratuberculosis Y.H. Gao, C.F. Wang, X.Y. Jiang, H.X. Ma, F.L. Zeng, Y.Q. Hu, X.Y. Liu, X. Zhu, Y.H. Dong and L. Liu	146
An Application of the Differential Transform Method to the Biochemical Reaction Systems M. Bayram, K. Yildirim and M. Kurulay	151
An Immunonanosilver Surface-Enhnaced Resonance Raman Scattering Method for Determination of Human Chorionic Gonadotrophin X.H. Zhang, K. Li, L.N. Hu, A.H. Liang and Z.L. Jiang	157
Novel Silkworm Pupa Protein (SPP)/Polyester Fabric W. Hu, G.X. Zhang, F.X. Zhang and D.Y. Wu	161
Study on the Effect of Sericin Content on Solubility of Silk Fibroin and the Properties of Silk Fibroin Membranes	1.65
Y.C. Jiang and Y.S. Zhang PCR Detection of Mycobacterium bovis DNA in Cattle Bloods	165
C.F. Wang, Y.H. Gao, X.Y. Jiang, J. Wang, G.M. Li, F.F. Chen and A.D. Qian	169
Extraction Technology and Physicochemical Properties of Broccoli Protein N. Li and Z.P. Zhu	174
A New Spectrophotometric Method for the Determination of Trace O ₃ Using the Particle Reaction of Rhodamine 6G-I ₃ C.Y. Lin, G.Q. Wen, A.H. Liang and Z.L. Jiang	178
Analysis of Environmental Disrupters in a Wastewater Treatment Plant V.N. Cristine, C.E. Müller, L.E. Ribeiro, N. Filho and I. Do	182
Oscillatory Calcium Concentration Designed through pH Dependent Equilibrium L.Q. Lv and L. Ji	188
State Feedback Control May Change the Dynamic Behavior of the Biochemical Process - Mathematical Model and Analysis	0
T. Yuan	194

Synthesis of Core-Shell Particles Consisted of Polysiloxane and Poly(butyl methacrylate- stryrene-acrylonitrile) by Microemulsion Polymerization	
S.J. Jia, Z.G. Ding and P.K. Jiang	203
Nanoscale Iron-Manganese Binary Oxide for As(III) Removal in Synthesized Groundwater S.Q. Kong, Y.X. Wang, C. Wang, L.L. Jin, M.L. Liu and M. Yu	209
The Effects of Particle Size and Morphology of Raw Materials on the Properties of MoSi ₂ Synthesized by SHS	212
Y. Zhou, C.L. Wei, G.T. Ye and C.Y. Liu	213
Low Temperature Synthesis of High Quality Zirconium Carbide Powder S.W. Zhang, Y. Wen and H.A. Yeprem	219
Chapter 5: Paper Processing and Biomass Industry	
Microwave Induced Co-Processing of Biomass/Coal Blends K.Q. Shi, T. Wu, H.T. Zhao, E. Lester and Y.D. Wang	227
Pickering-Type Emulsions of ODSA Sizing Agent Stabilized by Nano-Montmorillonite and N-Dodecane D.H. Yu, Z.Y. Lin and Y.M. Li	233
Refining Energy Consumption and Fiber Development on CMC-Pretreated Poplar APMP F.Z. Cheng, Y.M. Li and D.H. Chen	239
Adsorption of 4-Chlorophenol onto Activated Carbon Prepared from Wheat Straw: Equilibrium Study	245
Y.K. Li, Y.D. Wang, Y. Zhang, R.P. Han and Y.Q. Li	245
The Biomass Control in a Biochemical Reactor Process with Time-Varying Dilution Rate: A Mathematical Study T. Yuan	249
Chapter 6: Product Design and Production Management	
The Gene Ontology for Product Image Design L.L. Li, J.H. Li and K. He	257
Stabilized Dune Sand for Road Foundation Layers - Case of the Dune Sand of the Region of Djelfa (Algeria) G. Abderrahmane and M.K. Ratiba	263
The Application of Color Symbol to Product Design Y. Li, H. Yin, C.X. Hui, Y. Zhao and H.Q. Zhu	278
The Study on the University Sports Teams in Information Management Y. Peng	282
The Theoretical Analysis on Cognitive Process of the Safety Signs Based on Neuro-IE X.H. Zhou, M.L. Chen, X.Y. Wang and L. Wang	286
Chapter 7: Data Acquisition, Processing and Analysis	
Batch Gating for Data Association in Monocular SLAM E. Guerra, R. Munguia, Y. Bolea and A. Grau	295
A BOC Signal Synchronization Algorithm Based on TK Operator Z.L. Deng, L. Yang, L. Yin and Y. Xi	302
Spatial and Temporal Distribution Differences of Acid Rain in Heshan China Y.G. Liu	308
Image Processing Algorithm for the Manipulation of Object Using 3D Sensor D.W. Kim and J.E. Ha	312
Design of WSN Gateway for Granary Information Monitoring C.F. Qiao, S.Y. Yin, L. Ling, R.J. Cheng, C.L. Xu and J. Wang	316
The Design of Granary Storage Monitoring Node Based on Wireless Sensor Network C.F. Qiao, S.Y. Yin, L. Ling, R.J. Cheng, C.L. Xu and J. Wang	321

The Study of Characteristic of Drivers Visual Attention Based on Driving Simulation Device R.T. Xia and J. Fan	326
Research on Vulnerability of Aquifer to Petroleum Hydrocarbon Basing on the ANN and GIS	
Y.Z. Fang, Z.M. Ma and Y.Y. Luo	331
Feature Selection Based on Ant Colony Optimization for Image Classification L. Tu and L.Z. Yang	337
Measurement on Reaction Time of Visual Attention in Depth during Driving R.T. Xia and X.Y. Zhou	343
Chapter 8: Algoritms	
A Method for Completeness Testing of Dimensioning in 2D Drawing T.Z. Sui, Z. Tan, L. Wang, X.B. Gu and Z.H. Ren	351
The Simplication Algorithm and Characteristic Analysis of Variable Cross-Section Beam of Machining Center X.P. Yao, G.F. Yin and H. Fang	356
The Segmentation Algorithm for Pavement Cracking Images Based on the Improved Fuzzy Clustering	330
Y.X. Zuo, G.Q. Wang and C.C. Zuo	362
Chapter 9: Manufacturing and Equipment Technologies, Mechanical Engineering	
Composite Squeeze Casting of Large Parts H.N. Min, M. Shao and W. Zhang	369
Experimental Study on Depth of Discharge and Cycle Life of Lithium-Ion Battery C.M. Chen, S.H. Deng and Z.P. Wang	373
Application of Tamping Coke on Large-Scale BF Smelting Y.C. Dang, W.D. Shu, X.Y. Zhai, F. Lan and M.T. Chen	378
Mobile Inspection Robot M. Ciszewski, T. Buratowski, M. Giergiel, K. Kurc and P. Małka	385
The Performance Analysis and Prognosis Techniques of Gearbox C.C. Wang, Y. Kang and T.Y. Tu	393
Research Progress of Manufacturing Technology of Enhanced Heat Transfer Structures Z.S. He, C.C. Liang and X.F. Yang	399
Research on New Weighing System of Large Structure J.B. Zhang	404
Study on Adjustment of Large Structure Objects' Shipment Processing by Trailers J.M. Li	409
Development of a Parallel-Series Stabilized Platform System L.L. Wang, J.Z. Xiao, H.R. Wang, X.L. Liu and Z. Gao	414
New Methods to Evaluate Diesel Smoke from Inspection/Maintenance Vehicles Using Integration of Smoke Emissions over a Measurement Cycle of Snap-Acceleration Test at no Load	
C.H. Lee	419
Investigation of the Lox/Alcohol Propulsion System B.B. Vasques and L.C.G. de Souza	427
Chapter 10: Engineering and Applied Mechanics	
Thermoelastic Coupling Vibration of the Moving Rectangular Plate X.X. Guo	435
An Experimental Study on Flexural Behavior of Reinforced Concrete Beams with GFRP Bars and Recycled Coarse Aggregate	
S.H. Kim, Y.T. Lee, T.S. Kim and S.U. Hong	440

Numerical Simulation of the Piercing Process of Large-Sized Seamless Steel Tube F. Liu, Y.L. Qiu, Z.H. Song and S.W. Wang	444
Wavelet-Petrov-Galerkin Method for Numerical Solution of Boussinesq Equation M.A. Akinlar and A. Secer	451
Mechanical Property, HIC and SSCC Test Analysis of L245NS Anti-Sulfur Bending Pipe G.S. Song, K. Tong and X.D. He	456
Electroosmotic Flow and Heat Transfer in Microchannels: A Closed Form Solution C.H. Chen, S.J. Hwang and Y.L. Hwang	462
Influence of Punch Velocity and Strength Matching on the Quality of SPR with Half-Hollow Rivet Based Numerical Simulation	460
L.J. Xu, A. Cui and Q. Yang Three-Dimensional Parametric Modeling and Finite Element Analysis of Drum on Belt	468
Conveyer Z.T. Wu and W.J. Guan	474
Chapter 11: Optimization	
Optimal Aircraft Maintenance Crews Work Shifts with Integer Programming C.C. Liu and T.C. Wang	479
The Applications of Neural Networks in the Engineering Cost of Transmission Line H.F. Sun, Q.S. Tang and Y.L. Li	485
Solution to Holes Machining Path Planning by Intelligence Computation J. Zhang	491
Designing Hydrogen Networks with Multiple Impurities by Combining Concentration Potential Method with Sources Matching Methods	407
C.H. Pan, H.Y. Wang, L. Ma and M.Z. Lu Study on 3D Shape Optimization for Hydrodynamic Journal Bearing Using Goal Attainment Multi-Objective Function	497
X.P. Pang and J. Chen	505
Chapter 12: Automation and Detection Technologies	
Spectrophotometric Determination of Trace Hg ²⁺ with hsDNA-Modified Nanosilver Probe X.J. Liang, G.Q. Wen and Z.L. Jiang	513
A Method of RAM-Based Frequency Acquisition for Base Station Positioning Receiver X. Yuan, Z.L. Deng and Y. Zhang	517
The Detection of Surface Quality On-Line Based on Machine Vision in the Production of Bearings	
C. Wang and J.J. Gao Weakened Support Detection Based on Road Slab Vibration Response	523
F.M. Zhu, Q. Gan and Y.F. Li	528
Hand/Eye Calibration Using 3D-3D Correspondences D.W. Kim and J.E. Ha	532
Method for Estimating the Domino Effect in Quantitative Assessment M.L. Chen, Z.Q. Geng and Q.X. Zhu	536
Study on Detection of Structures Crack Based on Digital Image Technology Y.B. Zhao and W.J. Yao	541
The Research on Motion Trajectory Planning of an Axis Vehicle during Transport L. Li	545
Chapter 13: Control and PID Control Technologies	
The Application of Fuzzy Control in Position Control for Tanker Drag J.G. Yan, A. Xi, Z.B. Xiao and H.X. Xiong	553
Near-Optimality in Stochastic Control of Predator-Pray System with Markov Switching X.N. Li and D.M. Wei	558

ARM-Based Resistance Furnace Neural Network Temperature Control System Design H. Fang and H.L. Li	562
The Research on Speed Control of Tanker Drags System for Aerial Boom Refueling Test	
System Q.B. Xi, D.L. Yuan, Z.B. Xiao and X. Zhang	567
Robofish Formation Control Based on the Theory of Consensus Y.S. Deng	572
Design on Intelligent Overfreight Scale System of Coach in Vehicle Engineering Y.D. Song	579
Coal Belt Conveyor PID Controller Parameter Regulation with Neural Network X.M. Ma and X.X. Gao	583
A Current Compensation Bitline Sense Amplifier X. Li, N. Bai and Z.F. Wu	590
Chapter 14: Design in Manufacture	
A Computational Analysis of Flow Field in Twin-Track Subway Tunnel to Improve Air	
A Computational Analysis of Flow Field in Twin-Track Subway Tunnel to Improve Air Quality M. Juraeva, K.J. Ryu, S.H. Jeong and D.J. Song	599
Quality	599 605
Quality M. Juraeva, K.J. Ryu, S.H. Jeong and D.J. Song Design Simulation on Automatic Mechanical Transmission of Electric Vehicle	
Quality M. Juraeva, K.J. Ryu, S.H. Jeong and D.J. Song Design Simulation on Automatic Mechanical Transmission of Electric Vehicle Y.D. Song The Kinematic Design of 2K-2H Planetary Gear Reducers with High Reduction Ratio	605
Quality M. Juraeva, K.J. Ryu, S.H. Jeong and D.J. Song Design Simulation on Automatic Mechanical Transmission of Electric Vehicle Y.D. Song The Kinematic Design of 2K-2H Planetary Gear Reducers with High Reduction Ratio L.C. Hsieh and H.C. Tang Design on Four DOF Pneumatic Conveyance Manipulator Based on PLC	605 610
Quality M. Juraeva, K.J. Ryu, S.H. Jeong and D.J. Song Design Simulation on Automatic Mechanical Transmission of Electric Vehicle Y.D. Song The Kinematic Design of 2K-2H Planetary Gear Reducers with High Reduction Ratio L.C. Hsieh and H.C. Tang Design on Four DOF Pneumatic Conveyance Manipulator Based on PLC X.M. Wang, X. Zhou and M.T. Yang Study on Scroll Profile Design Using Involute of Elliptic for Scroll Compressor	605 610 616