



Research in Materials and Manufacturing Technologies IV

Part 2

Edited by
Prasad Yarlagadda and Yun-Hae Kim



9 783038 353492

ISBN-13: 978-3-03835-349-2

Advanced Materials Research Vols. 1061-1062, Part 2

Electronically available at <http://www.scientific.net>

**Research in Materials and
Manufacturing Technologies IV**
Part 2, pages 645-1302

**Prasad Yarlagadda
and Yun-Hae Kim**



Research in Materials and Manufacturing Technologies IV

PART 2

Selected, peer reviewed papers from the
4th International Conference on
Materials and Products Manufacturing Technology
(ICMPMT-2014),
September 18-19, 2014, Chongqing, China



Edited by

Prasad Yarlagadda and Yun-Hae Kim



Copyright © 2015 Trans Tech Publications Ltd, Switzerland

All rights reserved. No part of the contents of this publication may be reproduced or transmitted in any form or by any means without the written permission of the publisher.

Trans Tech Publications Ltd
Churerstrasse 20
CH-8808 Pfaffikon
Switzerland
<http://www.ttp.net>

Volumes 1061-1062 of
Advanced Materials Research *2-part-set*
ISSN print 1022-6680
ISSN cd 1022-6680
ISSN web 1662-8985

Full text available online at <http://www.scientific.net>

Distributed worldwide by

Trans Tech Publications Ltd
Churerstrasse 20
CH-8808 Pfaffikon
Switzerland

Fax: +41 (44) 922 10 33
e-mail: sales@ttp.net

and in the Americas by

Trans Tech Publications Inc.
PO Box 699, May Street
Enfield, NH 03748
USA

Phone: +1 (603) 632-7377
Fax: +1 (603) 632-5611
e-mail: sales-usa@ttp.net

printed in Germany

Research in Materials and Manufacturing Technologies IV

PART 2

Edited by
Prasad Yarlagadda
Yun-Hae Kim

Preface

The 2014 4th International Conference on Materials and Products Manufacturing Technology (ICMPMT 2014) took place in Chongqing, China, October 18-19, 2014. This conference series provides a forum for accessing to the up-to-date knowledge from both industrial and academic worlds and allows for the free exchange of ideas and challenges faced by these two key stakeholders and encourage future collaboration between these groups.

Following evaluation and feedback by the International Scientific Committee, accepted papers are selected for publications in those volumes. Studies presented in this book cover these topics: Metals and Alloys; Composite Materials and Applications; Chemical Materials, Bio-Materials, and Energy Materials; Building Materials and Construction Technology; Material Processing, Testing and Monitoring Technology; Advanced Design and Advanced Manufacturing Technology; Mechanical Dynamics, Structural Strength, Reliability and Risk Analysis and Assessment; Vibration, Sound, Noise Analysis and Control; CAD / CAM / CAE; Mechatronics, Industrial Robots, Automation and Control Technologies; Measurement Technology, Instruments and Sensors, Detection Technologies and Methodologies; Electronics, Circuit Technology and Electrics; Computer Applications and Mathematical Modeling, Intelligent Algorithms and Optimization; Industrial Engineering, Production Management, Operations, Quality and Control; Engineering Education and Engineering Management; etc

We would like to express our sincere thanks to all participants for their contributions and stimulating discussions. We thank the conference session chairmen for their help and assistance in defining the program of presentations. We are also grateful to the committee for their hard work.

The editors

Conference Organization

Chairmen

Prof. Yun-Hae Kim, Korea Maritime University, Korea

Prof. Prasad Yarlagadda, Queensland University of Technology, Australia

International Scientific Committee

Prof. Zhiming Shi, Inner Mongolia University of Technology, China

Prof. Xiangdong Liu, Inner Mongolia University of Technology, China

Prof. Yongquan Han, Inner Mongolia University of Technology, China

Prof. Junhui Dong, Inner Mongolia University of Technology, China

Prof. Pengcheng Wang, Inner Mongolia University of Technology, China

Prof. Liquan Ai, Hebei United University, China

Prof. Qingyou Liu, Southwest Petroleum University, China

Prof. Zheng Liang, Southwest Petroleum University, China

Prof. Xiaodong Zhang, Southwest Petroleum University, China

Prof. Zhijiu Ai, Southwest Petroleum University, China

Prof. Yongze Zhang, Baoji Oilfield Machinery Co.,LTD

Prof. Hong Zhang, China University of Petroleum

Prof. Jinglong Bu, Hebei United University, China

Prof. Daolun Chen, Ryerson University, Canada

Prof. Zunce Wang, Northeast Petroleum University, China

Prof. Sizhu Zhou, Yangtze University, China

Prof. Yong Peng, Southwest Petroleum University, China

Prof. Yongjin Chen, Kunming Univ. of Science of Technology, China

Prof. Weixing Chen, Xi'an Technological University, China

Prof. Wenbo Du, Beijing University of Technology, China

Prof. Huili Ding, Hebei University of Technology, China

Prof. Xianjin Yu, Shandong University of Technology, China

Prof. Ming Dong, Shanghai Jiao Tong University, China

Prof. Xiaoxing Feng, Hebei University of Technology, China

Prof. Wenzhi Fu, Jilin University, China

Prof. Zhengping Fang, Zhejiang University, China

Prof. Jian Gao, Guangdong University of Technology, China

Prof. Jing Guo, Dalian Polytechnic University, China

Prof. Kai Gu, Beijing Institute of Petrochemical Technology

Prof. Yin Biao Guo, Xiamen University, China

Prof. Junjie Hao, Beijing University of Technology, China

Prof. Julong He, Yanshan University, China

Prof. Xingang Hou, Lanzhou University of Technology, China

Prof. Jingtao Han, Beijing University of Technology, China

Prof. Xiaoming Jia, Hebei United University, China

Prof. Xiaolin Jia, Zhengzhou University, China

Prof. Zhenglian Jiang, Research Institute, Baosteel, China

Prof. Sihai Jiao, Research Institute, Baosteel, China

Prof. Shanqing Li, Research Institute, Baosteel, China

Prof. Xianghua Liu, Northeastern University, China

Prof. Jiacheng Liu, Tianjing University, China

Prof. Kaiqi Liu, Iron&Steel Research Institute, China

Prof. Yaqing Liu, North University of China

Prof. Jialu Li, Tianjin University of Technology, China

Prof. Yungang Li, Hebei United University, China

Prof. Dehong Lu, Kunming University of Science and Technology

Prof. Changsheng Li, Northeastern University, China

Prof. Baochun Lu, Nanjing University of Science and Technology

Prof. Chenxu Lu, Insti. of Process Eng., Chinese Academy of Science

Prof. Yi Shen, Hebei United University, China

Prof. Xiaoming San, Hebei United University, China

Prof. Xitang Wang, Wuhan University of Science and Technology

Prof. Jun Wang, Northeastern University, China

Prof. Qiang Wang, University of Jinan, China

Prof. Mingzhi Wang, Yanshan University, China

Prof. Jiuba Wen, Henan University of Science and Technology

Prof. Ming Wen, Hebei University of Technology, China

Prof. Kaiming Wu, Wuhan University of Science and Technology

Prof. Prasad Yarlagadda, Queensland University of Technology, Australia
Prof. Peiyu Yan, Tsinghua University, China
Prof. Xiaoyan Yuan, Tianjin University, China
Prof. Shao Hui Yin, Hunan University, China
Prof. Daoyuan Yang, Zhengzhou University, China
Prof. Chun Liang Zhang, Guangzhou University, China
Prof. Jianmin Zeng, Guangxi University, China
Prof. Ping Zou, Northeastern University, China
Prof. Shihong Zhang, The Institute of Metal Research, CAS
Prof. Changsheng Zhao, Sichuan University, China
Prof. AKM Nurul Amin, International Islamic University, Malaysia
Prof. Carlos Caceres, The University of Queensland, Australia
Dr. Chunsheng Lu, Curtin University of Technology, Australia
Dr. Dongbin Wei, University of Wollongong, Australia
Prof. Geun Jo Han, Dong-A University, Korea
Dr. Gui Wang, The University of Queensland, Australia
Prof. Jong Kook Lee, Chosun University, Korea
Prof. Ken-ichi Manabe, Tokyo Metropolitan University, Japan
Prof. Jeng-Haur Horng, National Formosa University, Taiwan
Prof. Jia-Horng Lin, Feng Chia University, Taiwan
Prof. Indra Putra Almanar, Universiti Sains Malaysia
Prof. Kyung-Man Moon, Korea Maritime University, Korea
Prof. P. S. Pa, National Taipei University of Education, Taiwan
Prof. Sagar Kamarthi, Northeastern University, USA
Prof. Shahrum Abdullah, University Kebangsaan Malaysia, Malaysia
Prof. Toshio Haga, Osaka Institute of Technology, Japan
Prof. Walid Mahmoud Shewakh, Beni Suef university, Egypt
Prof. Yun-Hae Kim, Korea Maritime University, Korea
Dr. Yuantong Gu, Queensland University of Technology, Australia
Prof. Yu-Shiang Wu, China University of Sci. and Tech., Taiwan
Prof. Heinz-Gunter, Brokmeyer, Technische Universität Clausthal, Germany
Prof. Zhengyi Jiang, University of Wollongong, Australia
Prof. Yun-Hae Kim, Korea Maritime University, Korea

Table of Contents

Preface	xxi
Organizing Committee	xxii

PART 2

Effect of Composition on the Tribological Behaviors of Ceramic-Matrix Friction Materials	
F.H. Wang and Y. Liu.....	645
Stress Distribution Behavior of Spherical Plain Bearing Fabricated by TiAl-Based Composite Materials Based on the Finite Element Analysis	
J. Wang, L.Y. Yang, S.R. Wang, G.J. Xue and C.X. Zhou	649
Numerical Calculation and Analysis of Water-Lubricated Stern Bearing Considering Elastic Hydrodynamic	
G. Liu	653
Novel Multi-Stream Plate Exchanger under High Pressure-Structure and its Design Method	
Y.P. Qu, W.Q. Wang, Y. Liu and Z.Y. Xu	658
Researches on Lifetime Modeling of LED Luminaires	
H.J. Li, L. Nie, F. Huang and W.J. Xiang.....	662
Fire Hazard Research of Wire Joint	
D.Z. E and M. Zhang	666
Investigation on Microstructure and Wear Resistance of the New CrWMoV High-Alloy Wear Resistant Cast Iron	
Z.T. Wang and H.M. Gao	670
Wear Behavior and Microstructural Evolution during Dry Sliding Wear of AZ51 Magnesium Alloy	
Y.B. Wang, T.F. Su, M.L. Yin, X. Han, X.Y. Li, C. Liang and J. An.....	674

Chapter 7: Advanced Design and Advanced Manufacturing Technology

A Graphical Symbol for Machining Process Information Description Using Model-Based Definition Technology	
F.J. Tian, H.Q. Zhang, X.Y. Chen, H.Q. Zhou and D.J. Chen	681
Design and Experimental Analysis of Pepper Fruit Preprocessing Machine	
Y. Zhang, C. Ge, Y.L. Li, M.F. Li, W.Y. Luo and G.Y. Tan	687
Design on a Removable Catalyst Muffler	
Q. Huang, L. Xiang and Z.L. He	692

Multi-Dimensional Assembly Process Data Management Method Based on Workflow	
S.J. Ruan, J.H. Liu and C.B. Zhuang	696
Research on System Architecture and Fine-Grained Access Control Strategy of Collaborative Development Platform	
L. Liu, R.M. Nie, R.Y. Chen, P. Zhou and R.L. Jia	701
Parallel Machine Scheduling Problem with a Resumable Availability Constraint	
Q. Zhang and C.X. Luo	708
Study on the Design Factors Affecting the Operating Actions that Can Be Used Easily at the Design Stage	
L. Pan, H.J. Cho and J.I. Park	712
The Design of Electrical Equipment Fault Diagnosis System Based on Fuzzy Inference	
F.H. Zou and H. Zhang	716
The Research of BDAR under Conditions of Informationalization	
S.C. Tu, X.J. Gu, G.D. Wang, S. Wang and B. Qi	720
Influence of Running Shoes Made of Different Materials on Athletes' Sprint Speed	
Y. Zhang	724
A Cooling Vest for Construction Workers	
M. Wu, J. Dong, A. Zhao, W.C. Tang, W. Sher, G.W. Chen, S. Chen, Z.D. Qin, Y. Zhou and Y. Wang	728

Chapter 8: Dynamics

An Adjustable Inertia Balance Support for High-Speed Scanning Probe Microscope	
G.Y. Yan	735
Study on Dynamic Characteristics of the Bridge Crane Hoisting Mechanism Based on State-Space Method	
A. Liu, W. He, Z.K. Li and L. Cheng	739
The Vibration Model Establishment and Solution of Bending-Torsion-Axial-Swing Coupled the Helical Gear Transmission System Based on Lumped Parameter Approximation Method	
C. Li, B.C. Wang and J.F. Li	743
The Mechanical Properties Comparative Analysis for Socked and Non-Socketed Composite Pile	
H. Chen and K.S. Ma	748
Mathematical Simulation of Concrete Fatigue Strength under Cyclic Loading	
G.G. Kashevarova, Y.E. Kurbatov and R.V. Sevastyanov	751
The Study on Contact Angle of High-Speed Ball Screw	
X.H. Xu, W.C. Tang and Y.H. Wang	757

Chapter 9: Vibration, Sound, Noise Analysis and Control

Dynamic Response Analysis of Submarine Pipeline under Action of Current F. Lei, Y.L. Deng and X.H. Zhao	767
Dynamics Analysis and Parameter Optimization of New Vibration Platform Y.B. Liu, C.X. Yin and J.J. Ma.....	771
Optimization of Sound Source Model for the Simulation of High Speed Train Interior Noise Using Finite Element Method D. Wu and J.M. Ge	776
The Simulation and Accuracy Analysis of Sound Filed Reconstruction Based on Fourier Transform-Source Simulation Technique H.H. Jiang, Y.J. Wang and Y. Xiang.....	780
Vibration Test and Analysis of No-Tillage Planter on the Maize Stubble Surface Y.Q. Liu, M.Q. Zhao, F. Liu, S. Dong and X. Zhang.....	788
Vibration Analysis Based on the Mathematical Model of the Air-Suction Device Tillage Seeder Seeding X. Zhang, M.Q. Zhao, F. Liu, S. Dong and Y.Q. Liu.....	794
Experimental Research on Thermal-Vibration for Composite Trilaminated Wing Structure S.G. Zhao, Y.W. Wang, D.F. Wu, Y. Pu and L. Shang.....	799

Chapter 10: CAD / CAM / CAE and Applications

Dynamic Responses Analysis of Permeable Breakwater Subjected to Random Waves H. Ping	809
Flow Field Analysis and Simulation of Tank Cars Based on Secondary Development of FLUENT M.Q. Li, B. Wang, D.Y. Li and L. Li	813
Integrated Thermal-Structural Analysis of a Reflecting Optical System with All Metal Components B. Lv, G.L. Wang and Y. Yang	818
Research and Development of Rapid Design System for Modular Machine Tool Based on KBE L.Z. Zhou, Q. Gu and Q.Z. Li.....	822
Research on the Calculation of the Security of High Concrete Arch Dam Based on the Finite Element Method J.L. He, Y.H. Guo and X. Zhu	829
The Finite Element Modeling and Structure Analysis of Dust Removal Fan Q.P. Han and B. Peng	833
Turbine Blade CNC Machining Simulation Analysis Based on MATLAB and UG J.N. Yang, R.X. Bai, L.Q. Dong, Z.H. Liu and X.J. Jiao.....	837

Characteristic Performance Analysis of Traction Motor on EMU with Broken Bars Using FEM
Y.X. Li, Y.F. Wang, X.L. Ge and Y. Lu.....841

The Discussion of the Simulation Accuracy of the Vehicle Suspension Coupled Dynamics Model
S.H. Liao, Y.H. Bao and S.D. Zhou.....849

Parameterized Highway Tunnel Inner Contour Design with ObjectARX
T. Peng, Q.F. Zhang and X.L. Wang854

The Small Road Surface Shot Blasting Cleaning Machine Design
C. Xue and Y. Hu.....858

Decreasing Airflow Velocity in High Speed Hard Disk Drive by Using Spoiler
W. Kankaew, K. Tangchaichit and J. Suriyawanakul.....862

Deformation of Hard Disk Drive Media Caused by Thermal Stress and Induced Air Flow
P. Padtha and K. Tangchaichit.....866

Simulation and Numerical Analysis of Nondestructive Testing on Weld Cracks by Eddy Current Thermography
L. Jiang, Z.P. Liu, X.L. Liu and G. Lu.....874

Finite Element Analysis of Anchor Impacting the Buried SOFC
Y.J. Wang, X.M. Fan, F. Yuan and H.B. Hao881

Chapter 11: Mechatronics, Industrial Robots, Automation and Control Technologies

2-DOF Synchronous Control of 6PUS-UPU Parallel Manipulator
K.J. Zheng, C. Wang and H. Zhou.....889

Asymptotic Properties of Sampling Zero Dynamics for Nonlinear Systems in the Case of Time Delay and Relative Degree Two
X.Y. Li, C. Zeng, T. Zhou, Y.J. Ren and Y.X. Li.....893

PID Control of a Parallel Vibration Isolation System Based on Pneumatic Artificial Muscle
Y.B. Liu, J.J. Ma and C.X. Yin.....899

Study on Adaptive Fuzzy Control System of Settlement Technology
X.P. Chen904

Study on the Design of the Ventilation of Ship Engine Room Control System
S. Ling.....908

The Design of the Test Control System of Small Piston Aircraft Engine
Y.P. Li and W. Li.....912

A Semantic Gateway for Home Automation Networks
S.Q. Hu, X.L. Zhang and W. Dang.....916

Analysis and Control of the Fault in the Hydraulic System of Coal-Machinery
L.X. Hou, J. Kong, F.G. Li, C.X. Ju and W. Xu.....921

Quasi-Close Loop Control of NC Machine Tools
Q.Q. Wang, Y.H. Feng and Y.L. Wang.....927

Research Situation of Deicing Device of Transmission Line Deicing Robot F.Q. Wang, C.Z. Cao, J.D. Wang, N. Zhou, A.Q. Sun and Y.D. Guo.....	931
Study on Prediction of Chaotic Time Series Using Least Squares Support Vector Machines X.Y. Wang, G.F. Gao, Z. Qu and H.F. Pu	935
Manipulator Tactile Telepresence Research Based on one Type Pressure-Sensitive Sensor C.F. Wang, A.Y. Ji and J.J. Chen	939

Chapter 12: Measurement Technology, Instruments and Sensors, Monitoring, Detection Technologies and Methodologies

Design of Multi Parameter Water Quality Online Monitoring System Base on FPGA B.L. Yang, J.Y. Ye and Z.F. Cheng.....	945
Expert System Based on Fuzzy Rules for Monitoring and Diagnosis of Operation Conditions in Rotating Machines R.F.M. Marçal, K. Hatakeyama and D.J. Czelusniak	950
Properties of Films Characterized by Scanning Acoustic Microscope H.J. Yan, C.G. Xu, D.G. Xiao and Q. Lin	961
Research on the Secondary Compensation Method of the Screw Pitch Error Based on the Laser Interferometer X.L. Shi, H.L. Liu, H. Li and C. Liu.....	966
Study on Calibration and Test of Automotive Wheel Hub Detection System X.D. Yang, Y.Z. Men, L. Yu, J.G. Gao and H.B. Yu.....	970
A Skywave OTHR Adaptive Frequency Selection Method Based on Preliminary Criterion and Weighted Criterion S.H. Liu, X.G. Liu and Z.J. Sun.....	974
A Water-Solution Fluorescence Probe for H₂O₂ Based on Naphthalimide Derivative Y.M. Shen, S.M. Yang, L.C. Xi, W.Y. Cao, L.L. Zhou, Y. Yang, S.D. Feng, X.F. Peng, X.Y. Zhang, C.X. Zhang, J.L. Jin and Q.Y. Zhen	978
Method and Apparatus for Measuring the Strength of Weak Binding Coating Interface F. Wang and B.H. Wu.....	983
Moisture Resistance of the As-S-I Glasses A.V. Semench, M.V. Kurushkin and V.A. Markov	987
Study on the Influence of the Waveguide Layer to the Far Field of GaN Based Laser Diode H. Liao, M.Z. Sun, J.J. Zhang, Y.W. Zhang, T. Fan, C.Y. Song and K. Yang	991
The Development of Initial Position End-of-Line Test System for PMSM Y.L. Cao and P. Cao	995
Study and Application of Machine Vision Technique for Quality Detection of Agricultural Products X.P. Mo and Z.G. Pan.....	999

Determination of the Whole Stiffness of Paper Plate
S. Guo and D.Y. Huang 1003

Calibration Methods of Silicate Analyzer
L. Wang and Y.F. Xu..... 1008

Chapter 13: Power, Electronics, Circuit Technology

Analysis of Operation of AVC System in Fuzhou Power Grid
J.J. Xiong, W. He and H. He..... 1013

Analysis of the Influence of High-Speed Railway on Power Quality
J.J. Xiong, W.B. Wang and W. He 1017

The Study of Characteristic Impedance of Conductive Transmission Line in FPC(Flexible Printed Circuit Board) Design and Process
B. Li, Y.L. Liu, X.D. Zhang and Z.J. Pan..... 1021

Fault Diagnosis of Traction Inverter Based on Wavelet Analysis and Neural Network
Y.F. Wang, W.M. Zhang, X.L. Ge and Y. Lu 1025

Optimized Design of Double-Loops Controller for Single-Phase Pulse Rectifier without LC Resonant Filter Circuit
W.M. Zhang, Y.X. Li, X.L. Ge and Y. Lu..... 1031

Simulation of Distributed Photovoltaic Power Connecting to Grid Based on ETAP
W.B. Wang and J.J. Xiong..... 1039

The Design of Semiconductor Laser Driver and Simulation Analysis of Constant Current Drive Circuit Based on Multisim 10
L.B. Wu..... 1043

Chapter 14: Computer Applications and Mathematical Modeling, Numerical Methods, Intelligent Algorithms and Optimization

A Higher-Dimensional Lie Algebra and 4×4 Discrete Soliton Hierarchy with Self-Consistent Sources
L. Li..... 1051

A New 3×3 Discrete Soliton Hierarchy with Self-Consistent Sources
L. Li..... 1055

A New Coupled Map Car-Following Model Considering the Synergy Effect of Ahead-Backward Vehicles
T. Zhou, Y.X. Li, X.Y. Li and C. Zeng 1059

Construction of Compactly Supported Nonseparable Orthogonal Wavelet with Dilation 4
H.E. Yang..... 1064

Power Reduction Techniques in Cloud Data Centers
L. Tang, Z.C. Cai, G.L. Chen and X.W. Li..... 1070