

ISSN 1007-1172

Edited by
Editorial Board of
Journal of
Shanghai
Jiaotong
University

JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY



Editor in Chief
ZHENG Hang

Vol. E-5
No. 1

JUNE 2000

The Proceedings of 1st International Conference on Thermal Process Modeling and Computer Simulation

Haoran High-tech Building, Shanghai Jiaotong University, Shanghai, 200030,
The People's Republic of China, March 28~30, 2000

CONTENTS

Plenary Session (A)

- Research and Application Prospect of Computer Simulation on Heat Treatment Process
..... *Jiansheng PAN, Yongjun LI, Jianfeng GU, et al* (1)
- Process Modeling for Heat Treatment: Current Status and Future Developments
..... *Tatsuo Inoue, Kiyoshi Funatani, George E. Totten* (14)
- Computer Modeling: an Important Tool in Materials Processing
..... *L. L. Meekisho, X. Chen* (26)

Plenary Session (B)

- The Trends and Tasks of Modeling and Simulation for Reduction of Heat Treatment Distortion *Kiyoshi Funatani* (35)
- Development of Thermal Process and Numerical Modeling
..... *Zhuang LIU, Pan ZENG* (42)

Surface Treatment and Welding(A)

- Integral Recrystallization Modelling *Guenter Gottstein, V. Marx, R. Sebald* (49)
- Finite Differential Method Simulation on Temperature Field in Process of Laser Quenching
..... *Gang FAN, Yihong GUAN, Tieli CHEN, et al* (58)
- A Numerical Model Coupling Electromagnetism and Thermomechanics Application to Induction Heating Modeling *Francois Bay, Valérie Labbé, Yann Favennec* (63)
- Calculation of Temperature Field During Laser Transformation Hardening of Cylindrical Bodies *Liwen ZHANG, Lixia WEI, Guoliang ZHANG, et al* (72)
- Computer Prediction on Stress Distribution During Laser Quenching
..... *Jiatao ZHANG, Gang FAN, Guoyou GAN, et al* (76)

Calculation of Transient Stress Field During Laser Transformation Hardening Process
 *Liwen ZHANG, J. Th. M. De Hosson, Yuanliang XIA, et al* (82)

The Computer Simulation System for Range Distribution of Various Implantat
 *Wei WANG, Xun CAI, Qiulong CHEN, et al* (86)

Surface Treatment and Welding(B)

FEM-BEM Coupling for the Modelling of Induction Heating Processes Including
 Moving Parts *J. M. Bergheau, Ph. Conraux* (91)

Finite Element Method Analysis of Stress Field Considering Thermal Coupled Force
 During Laser Process *Gang FAN, Yihong GUAN, Jiatao ZHANG, et al* (100)

Weld Models Incorporating the HAZ Phase Transformation Effects, Comparison between
 Experimental and Numerical Results
 *Y. Vincent, Jean-Francois Jullien, F. Fouquet, et al* (107)

Finite Element Simulation of Processes Involving Moving Heat Sources, Application to
 Welding and Surface Treatment *J. M. Bergheau, V. Robin, F. Boitout* (114)

Current Density Distribution in Gas Tungsten Arc Welding Process
 *Hongming GAO, Lin WU, Honggang DONG* (123)

Quenching & Tempering

Generalization of Results of Computations and Natural Experiments at Steel Parts Quenching
 *Nikolai I. Kobasko* (128)

✓ Numerical Analysis of Thermal Distortion and Residual Stresses in H13 Steel Due to
 Vacuum Gas Quenching *D. Ruan, A. S. Blichblau* (135)

Research on the Numerical Simulation of the Tempering Process of Steel
 *Wei SHI, Xuejun XU, Kefu YAO, et al* (140)

✓ Modelling of High Speed Gas Quenching *P. F. Stratton, D. Ho, N. Saxena* (146)

Application of the Controllable Quenching Technology to the Quenching and
 Tempering Workpieces *Nailu CHEN, Bo LIAO, Wanbin NIU, et al* (156)

Stress Field Analysis of Carburized Specimen and Its Numerical Simulation
 *Qingxiang YANG, Yukui GAO, Yanli LI, et al* (161)

Computer Predictions and Experimental Verification of Residual Stresses and Distortion in
 Carburizing - Quenching of Steel
 *Dong Ying JU, Michiharu Narazaki, Hirofumi Kamisugi, et al* (165)

Application of Computer in the Design of Process Thermal Cycle of Steel
 *Liping ZHAO, Zongchang LIU, Jianming DAI, et al* (173)

Phase Transformation

- An Internal State Variable Model for the Low Temperature Tempering of Low Alloy Steels
..... *Mark T. Lusk, Young-Kook Lee, Herng-Jeng Jou, et al* (178)
- Transformation Plasticity —The Effect on Metallo-Thermo-Mechanical Simulation
of Carburized Quenching Process
..... *Shigeru Yamanaka, Takayuki Sakanoue, Toshikazu Yoshii, et al* (185)
- Estimation of Solid Phase Relationship in the Al_2O_3 - SiO_2 - Re_2O_3 Systems
..... *Lin LI, Weiyang SUN, Peiling WANG, et al* (196)
- Numerical Study of the Plastic Behaviour of a Low Alloy Steel during Phase Transformation
..... *J. Devaux, J. B. Leblond, J. M. Bergheau* (206)
- A Numerical Model for Multiple Phase Transformations in Steels during Thermal Processes
..... *R. Fortunier, J. B. Leblond, J. M. Bergheau* (213)
- Kinetic Model of Nucleation and Growth *Ning GAO, Guoxue CHEN, Zhuang LIU* (221)
- The Influence of Stress and Strain on Kinetics of Bainite Transformation
..... *Kefu YAO, Chencheng LIU, Wei SHI, et al* (225)
- New Computer-Aided Method for Optimum Use and Properties Prediction of Steels
..... *Yongping YU, Yumin XUN, Jian LI* (230)

Plastic Working and Casting (A)

- Recent Development of Process Simulation and Its Applications to Manufacturing Processes
..... *W. T. WU, J. P. TANG, G. LI* (235)
- Computer Simulation on Temperature Rise in Process of Wire Drawing
..... *Jiatao ZHANG, Jialin SUN, Jinming LONG, et al* (242)
- The Numerical Simulation on Hollow Part's Precise Sizing Process with Cross—Wedge Rolling
..... *Jingliang WANG, Chunguo XU, Guangsheng REN* (248)
- Implementation of Heat Treatment Process Simulation with Object-Oriented Method
..... *Yongping YU, Yuzhen NIU, Jian LI, et al* (253)

Plastic Working and Casting (B)

- Numerical Simulation of Coupled Thermo-mechanical Behavior of a Cylinder Billet during
Hot-Forging Process *Peiran DING, Dong-Ying JU, Shoji Imatani, et al* (263)
- Computer Aided Simulation on Precision Cold Forging of Universal Joint Cross
..... *Hua LIU, G. N. LIU, Y. J. HUO, et al* (270)
- Computer Simulation of Thermal-Mechanical Processing
..... *Ruiheng WU, Zigang LI, Hongbing CHANG, et al* (274)

Numerical Simulation and Optimization Design of Electromagnetic Fields in the Electromagnetic Casting of Copper Round Billet	<i>Haixi YANG, Tao GONG, Zuosheng LEI, et al</i>	(282)
Computer Simulation of Mould Filling and Solidification of Castings	<i>Zhian XU</i>	(286)
Chemical Treatment		
Mathematical Models and Computer Simulation of Nitrogen Concentration Profiles in Pulse Ion Nitrided Layers	<i>Mufu YAN, Jihong YAN, Lifang XIA</i>	(294)
A Simulational Study of Precipitation Kinetics and Morphology in Nitridation of Alloy Steels	<i>Lang ZHOU, Xiuqin WEI, Zhangmin DENG</i>	(298)
Computer Simulation of Thermochemical Treatments: Modelling Diffusion and Precipitation in Metals	<i>R. Fortunier, J. B. Leblond, J. M. Bergheau</i>	(303)
Numerical Simulation of Carbon Concentration Profiles in Case Layer of Steel 20 RE-Carburized in Multipurpose Furnace with Drip-Feed Atmosphere	<i>Mufu YAN, Jihong YAN, Zhiru LIU</i>	(310)
Quenchant & Thermal Analysis		
Computer Based Simulation Maturation in Y2K	<i>K. L. Wong, A. J. Baker</i>	(314)
Inverse Heat Conduction and Data-Type Issues for Advanced Diagnostic Analysis	<i>Jay I. Frankel</i>	(321)
Thermal Aspects in Lubrication System Design for Internal Combustion Engines	<i>Jochen Pohl, Karl-Erik Rydberg, Petter Krus</i>	(332)
Research on Optimizing the Hidden Layer Structure of ANN-Based Model and Its Application in Predicting End-Quench Curves of Steels	<i>Liang WU, Weisheng GU</i>	(342)
Numerical Simulation on Thermal Stress of Large-Scale Bearing Roller during Heating Process of Final Heat Treatment	<i>Yongjun LI, Jiansheng PAN, Weimin ZHANG, et al</i>	(347)
Calculation of the Hardness Space Distribution in the As Quenched Condition of a Medium Hardening Tool Steel	<i>G. Sánchez Sarmiento, J. Vega</i>	(351)
Texture Development of a Cold-Rolled CuZnAl Alloy	<i>Wenqing YUAN</i>	(362)