MG1/5td

B

Process Metallurgy and Materials Processing Science

METALLURGICAL AND MATERIALS TRANSACTIONS

Volume 45B • Number 1 February 2014



11663 • ISSN 1073-5615 45B(1) 1–328 (2014)







Contents

COMMUNICATIONS		
Pyrometallurgy		
M. S. Islam, M. A. Rhamdhani, and G. A. Brooks	1	Electrically Enhanced Boron Removal from Silicon Using Slag
Solidification		
Huabei Peng, Yuhua Wen, Yangyang Du, Jie Chen, and Qin Yang	6	A New Set of Cr _{eq} and Ni _{eq} Equations for Predicting Solidification Modes of Cast Austenitic Fe-Mn-Si-Cr-Ni Shape Memory Alloys

Symposium: CFD Modeling and Simulation in Mate	eriais Pro	cessing
Jean-Pierre Bellot, Valerio De Felice, Bernard Dussoubs, Alain Jardy, and Stéphane Hans	13	Coupling of CFD and PBE Calculations to Simulate the Behavior of an Inclusion Population in a Gas-Stirring Ladle
Brian G. Thomas, Quan Yuan, Sana Mahmood, Rui Liu, and Rajneesh Chaudhary	22	Transport and Entrapment of Particles in Stee Continuous Casting
Andreas Ludwig, Abdellah Kharicha, and Menghuai Wu	36	Modeling of Multiscale and Multiphase Phenomena in Materials Processing
Laurentiu Nastac	44	A Multiscale Transient Modeling Approach for Predicting the Solidification Structure in VAR-Processed Alloy 718 Ingots
Matthieu Revil-Baudard, Alain Jardy, Hervé Combeau, Faustine Leclerc, and Véronique Rebeyrolle	51	Solidification of a Vacuum Arc-Remelted Zirconium Ingot
Pyrometallurgy		
Mao Chen, Sreekanth Raghunath, and Baojun Zhao	58	Viscosity Measurements of SiO ₂ -"FeO"-MgO System in Equilibrium with Metallic Fe
Rogério Navarro C. de Siqueira, Eduardo de Albuquerque Brocchi, Pamela Fernandes de Oliveira, and Marcelo Senna Motta	66	Hydrogen Reduction of Zinc and Iron Oxide Containing Mixtures
Meilong Hu, Lu Liu, Xuewei Lv, Chenguang Bai, and Shengfu Zhang	76	Crystallization Behavior of Perovskite in the Synthesized High-Titanium-Bearing Blas Furnace Slag Using Confocal Scanning Laser Microscope
Gi Hyun Kim and Il Sohn	86	Role of B ₂ O ₃ on the Viscosity and Structure in the CaO-Al ₂ O ₃ -Na ₂ O-Based System
Jesse F. White and Du Sichen	96	Mass Transfer in Slag Refining of Silicon with Mechanical Stirring: Transient Interfacia Phenomena

Xing Xing, Guangqing Zhang, Harold Rogers, Paul Zulli, and Oleg Ostrovski	106	Effects of Annealing on Microstructure and Microstrength of Metallurgical Coke
Jong Yeong Yu, Youngjo Kang, and Il Sohn	113	Novel Application of Alkali Oxides in Basic Tundish Fluxes for Enhancing Inclusion Removal in 321 Stainless Steels
Yu-Lan Zhen, Guo-Hua Zhang, Xu-Long Tang, and Kuo-Chih Chou	123	Influences of Al ₂ O ₃ /CaO and Na ₂ O/CaO Ratios on Viscosities of CaO-Al ₂ O ₃ -SiO ₂ -Na ₂ O Melts
Physical Chemistry		
Min-Su Kim, Hae-Geon Lee, and Youn-Bae Kang	131	Determination of Gibbs Free Energy of Formation of MnV ₂ O ₄ Solid Solution at 1823 K (1550 °C)
Dong-Ping Tao	142	Prediction Expressions of Component Activity Coefficients in Si-Based Melts
Jesse F. White, Luyao Ma, Karl Forwald, and Du Sichen	150	Reactions Between Silicon and Graphite Substrates at High Temperature: In Situ Observations
Solidification		
K. T. Kashyap and K. B. Puneeth	161	Study of Soft Impingement of Diffusion Fields and Its Effect on Cast Microstructure
Tao Zhang, Zaiyan Shang, Ming Chen, Jinjiang He, Baoguo Lv, Xingquan Wang, and Xiaodong Xiong	164	High-Purity Nickel Prepared by Electron Beam Melting: Purification Mechanism
Materials Processing		
Torbjörn Carlberg and Anders E. W. Jarfors	175	On Vertical Drag Defects Formation During Direct Chill (DC) Casting of Aluminum Billets
J. J. S. Dilip and G. D. Janaki Ram	182	Friction Freeform Fabrication of Superalloy Inconel 718: Prospects and Problems
Chul Kyu Jin, Chang Hyun Jang, and Chung Gil Kang	193	Effect of the Process Parameters on the Formability, Microstructure, and Mechanical Properties of Thin Plates Fabricated by Rheology Forging Process with Electromagnetic Stirring Method
Keita Kawahira, Youichi Saito, Noboru Yoshikawa, Hidekazu Todoroki, and Shoji Taniguchi	212	Penetration Depth of Microwave into the Mixture of Goethite with Graphite Estimated by Permittivity and Conductivity
Mark Li, Torstein Utigard, and Mansoor Barati	221	Removal of Boron and Phosphorus from Silicon Using CaO-SiO ₂ -Na ₂ O-Al ₂ O ₃ Flux
Welding & Joining		
Zhixiong Zhu, Lenka Kuzmikova, Huijun Li, and Frank Barbaro	229	The Effect of Chemical Composition on Microstructure and Properties of Intercritically Reheated Coarse-Grained Heat-Affected Zone in X70 Steels

Mathematical Modeling

Rongbin Li, Chao Zhang, Shaojun Zhang, and Liejin Guo	236	Experimental and Numerical Modeling Studies on Production of Mg by Vacuum Silicothermic Reduction of CaO·MgO
Ying Liu, Fu-Yong Su, Zhi Wen, Zhi Li, Hai-Quan Yong, and Xiao-Hong Feng	251	CFD Modeling of Flow, Temperature, and Concentration Fields in a Pilot-Scale Rotary Hearth Furnace
Zhiyu Liu, Bo Wang, Qinghua Zhang, Jie Ma, and Jieyu Zhang	262	Numerical Simulation of Filling Process During Twin-Roll Strip Casting
Qiang Wang, Baokuan Li, Zhu He, and Naixiang Feng	272	Simulation of Magnetohydrodynamic Multiphase Flow Phenomena and Interface Fluctuation in Aluminum Electrolytic Cell with Innovative Cathode
Lu-Sha Zhang, Xiao-Feng Zhang, Bao Wang, Qing Liu, and Zhi-Gang Hu	295	Numerical Analysis of the Influences of Operational Parameters on the Braking Effect of EMBr in a CSP Funnel-Type Mold
Computational Materials Science		
Jean-Philippe Harvey and Aimen E. Gheribi	307	Process Simulation and Control Optimization of a Blast Furnace Using Classical Thermodynamics Combined to a Direct Search Algorithm
Erratum		
Jung Ho Heo, Byung-Su Kim, and Joo Hyun Park	328	Erratum to: Effect of CaO Addition on Iron Recovery from Copper Smelting Slags by Solid Carbon

The contents for the latest issue of *Metallurgical and Materials Transactions A* can be found online at: http://www.springerlink.com/content/1073-5623

DISCLAIMER. The acceptance and publication of manuscripts in METALLURGICAL AND MATERIALS TRANSACTIONS does not imply that the reviewers, key readers, editors, or the sponsoring Societies (ASM International and The Minerals, Metals & Materials Society) accept, approve, or endorse the data, opinions, and conclusions of authors. While manuscripts published in METALLURGICAL AND MATERIALS TRANSACTIONS are intended to have archival significance, authors' data and interpretations are frequently insufficient to be directly translatable to specific design, production, testing or performance applications without independent examination and verification of their applicability and suitability by professionally qualified personnel.