

CD-ROM
Included



Light Metals 2014

Edited by
JOHN GRANDFIELD

TMS

WILEY

**Light
Metals
2014**

TMS2014

143rd Annual Meeting & Exhibition



**New proceedings volumes from the TMS2014 Annual Meeting,
available from publisher John Wiley & Sons:**

- **5th International Symposium on High-Temperature Metallurgical Processing**
- **Advanced Composites for Aerospace, Marine, and Land Applications**
- **Celebrating the Megascale: Proceedings of the Extraction and Processing Division Symposium on Pyrometallurgy in Honor of David G.C. Robertson**
- **Characterization of Minerals, Metals, and Materials 2014**
- **Energy Technology 2014: Carbon Dioxide Management and Other Technologies**
- **EPD Congress 2014**
- **Light Metals 2014**
- **Magnesium Technology 2014**
- **Rare Metal Technology 2014**
- **Shape Casting: 5th International Symposium 2014**
- **TMS 2014 Supplemental Proceedings**

To purchase any of these books,
visit **www.wiley.com**.

TMS members: Log in to the Members Only area of **www.tms.org** and learn how to get your discount on these and other books offered by Wiley.



Light Metals 2014

Proceedings of the symposia sponsored
by the TMS Aluminum Committee
at the TMS 2014 Annual Meeting & Exhibition,
February 16-20, 2014
San Diego, California, USA

Edited by
JOHN GRANDFIELD

WILEY

TMS

**Copyright © 2014 by The Minerals, Metals & Materials Society.
All rights reserved.**

**Published by John Wiley & Sons, Inc., Hoboken, New Jersey.
Published simultaneously in Canada.**

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of The Minerals, Metals, & Materials Society, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 750-4470, or on the web at www.copyright.com. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permission>.

Limit of Liability/Disclaimer of Warranty: While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

Wiley also publishes books in a variety of electronic formats. Some content that appears in print may not be available in electronic formats. For more information about Wiley products, visit the web site at www.wiley.com. For general information on other Wiley products and services or for technical support, please contact the Wiley Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Library of Congress Cataloging-in-Publication Data is available.

<p>ISBN 978-1-11888-908-4 ISSN Number 1096-9586 Printed in the United States of America.</p>
--

10 9 8 7 6 5 4 3 2 1

WILEY

TMS

TABLE OF CONTENTS

Light Metals 2014

Preface	xxiii
About the Editor	xxv
Program Organizers.....	xxvii
Aluminum Committee	xxxiii

Alumina and Bauxite

Bayer Process/Quality

Evolution of the Technology for the Production of Alumina from Bauxites.....	5
<i>V. Medvedev and S. Akhmedov</i>	
Approaches to the Processing of Jamaican Bauxite with High Goethite Content	11
<i>D. Lawson, A. Rijkeboer, D. Dajkovich, M. Jackson, and H. Lawrence</i>	
Improvement of Processing Characteristics of High Carbonate and High Silica Diasporic Bauxite by Enriching Roasting	19
<i>A. Suss, A. Fedyaev, A. Panov, I. Paromova, D. Finin, and A. Damaskina</i>	
New High-Performance Crystal Growth Modifiers to Improve Alumina Trihydrate Quality and Yield	25
<i>R. Chester, J. Kildea, and E. Phillips</i>	

Process Control

Votorantim Metals - CBA Alumina Refinery Precipitation Modeling.....	33
<i>T. Franco and R. Seno Junior</i>	
Value of Systems Integration to Optimize Operation in Alumina Refineries.....	39
<i>H. Tremblay</i>	
Study of Influences on the Bauxite Moisture and Solids in Filtrate in the Hyperbaric Filters through Design of Experiments (DOE) Statistic Tool.....	45
<i>A. Pinheiro, A. Borges, and E. Laubyer</i>	
Increased Operational Flexibility in CFB Alumina Calcination.....	49
<i>L. Perander, I. Chatzilamprou, and C. Klett</i>	
Increasing Extraction Efficiency Using a Closed Grinding Circuit.....	55
<i>J. Meira and R. Seno Junior</i>	

Cost Reduction/Alumina Recovery

A Review of Two Phase Flow Modeling and Its Applicability to the Bayer Process	61
<i>A. Scarsella and H. Schmidt</i>	
Pipeline Scaling Prevention and Removal Methods in Bayer Digestion Process.....	67
<i>W. Cao, H. Li, W. Tian, and H. Zhong</i>	

Using of Silicate-Type Polymers as Inhibitor of Scaling at Aluminate Liquors Heating and Evaporation.....	73
<i>V. Kazakov and V. Lipin</i>	
Crystal Structure and Alumina Leaching Property of Na ₂ O Doped C ₁₂ A ₇	77
<i>B. Wang, S. Zong, H. Sun, J. Zhang, Y. Zhang, D. Liu, and J. Liu</i>	
Decomposition Property of γ -2CaO·SiO ₂ during Leaching Process of Calcium Aluminate Slag.....	81
<i>H. Sun, B. Wang, J. Zhang, and S. Zong</i>	
Effect of Calcium/Aluminium Ratio on Crystal Structure and Al ₂ O ₃ Leaching Property of 12CaO·7Al ₂ O ₃	87
<i>B. Wang, J. Zhang, S. Zong, and H. Sun</i>	
Multi-Steps Carbonation Treatment of Calcified Slag of Red Mud	91
<i>G. Lv, X. Zhu, T. Zhang, F. Guo, L. Pan, Y. Liu, Q. Zhao, Y. Li, X. Jiang, and J. He</i>	

Non-Bayer Process

Tests on Comprehensive Recovery of Iron Minerals and Bauxite from High Iron Diasporic Bauxite by Medium Temperature Metal-Based Roasting	99
<i>S. Hu, H. Zhao, and M. Guo</i>	
The Influence of the Mineral Composition of Low-Grade Aluminum Ores on Aluminum Extraction by Acid Leaching.....	105
<i>A. Suss, A. Damaskin, A. Senyuta, A. Panov, and A. Smirnov</i>	
Dry Sintering of Nepheline - A New More Energy Efficient Technology	111
<i>S. Skaarup, Y. Gordeev, V. Volkov, and V. Sizyakov</i>	
A Study on Sintering Process Optimization of Alumina Attraction from Fly Ash.....	117
<i>Y. Xiao, Q. Sun, B. Wang, X. Liu, X. Wang, L. Zhao, and G. Yu</i>	
Effect of Pressure on Alumina Extraction from Low-Grade Bauxite by Acid-Leaching Method.....	121
<i>Y. Wu, L. Li, and M. Li</i>	
Extraction of Alumina from Coal-Derived Pyrite Flotation Tailing by Pre-Desilication–Bayer Process	125
<i>J. Luo, M. Rao, M. Liu, G. Li, and T. Jiang</i>	
Extracting Alumina from Low Grade Bauxite with Ammonium Bisulfate Leaching	131
<i>L. Li, Y. Wu, and Y. Liu</i>	
Hydrochemical Method of Low-Quality Raw Materials Processing to Alumina.....	135
<i>V. Kazakov and V. Lipin</i>	

Waste Recovery

The Enxal Bauxite Residue Treatment Process: Industrial Scale Pilot Plant Results	143
<i>E. Balomenos, D. Kastritis, D. Panias, I. Paspaliaris, and D. Boufounos</i>	
Sustainability and Bauxite Deposits	149
<i>P. ter Weer</i>	
Valorization of Alumina Red Mud for Production of Geopolymeric Bricks and Tiles	155
<i>D. Panias, I. Giannopoulou, and D. Boufounos</i>	

Study of Alternative Technologies for Residue Disposal (Red Mud)	161
<i>K. Nery, J. Ávila, M. Scarmínio, L. Bittar, R. Moreno, and R. Seno</i>	
Economic Analysis of Producing Alumina with Low-Grade Bauxite (Red Mud) by Calcification-Carbonization Method.....	165
<i>Q. Zhao, Z. Zhang, X. Zhu, Y. Liu, G. Lv, T. Zhang, and S. Wang</i>	
Recovery of Titanium Oxide from Undigested Sand of an Indian Alumina Refinery and Preparation of Value Added Titanium Carbide	169
<i>B. Mohapatra, S. Singh, C. Mishra, and B. Mishra</i>	

Aluminum Alloys: Development, Characterization and Applications

Development and Application

AMAG 6XXX Series Alloys for Chassis Application in the Automotive Industry	177
<i>J. Berneder, R. Prillhofer, J. Enser, and T. Grohmann</i>	
Heat Treating of High Pressure Die Cast Components: Challenges and Possibilities	183
<i>S. Seifeddine, D. Poletaeva, M. Ghorbani, and A. Jarfors</i>	
Influence of the Chemical Composition on the Ductility of an AlSiCuZnFe Recycling Foundry Alloy	189
<i>P. Pucher, H. Böttcher, H. Kaufmann, H. Antrekowitsch, and P. Uggowitzer</i>	
Assessment of Hot Cracking during TIG Welding of B206 Aluminum Alloy.....	195
<i>F. D'Elia, A. Lombardi, C. Ravindran, D. Sediako, and K. Rao</i>	
Influence of Microstructure on the Folding Behavior of Crash Relevant Aluminum Extrusion Parts	201
<i>M. Rosefort, R. Baumgart, C. Matthies, and H. Koch</i>	
Effect of TiC Powder Addition on the Grain Refinement Response of B319 Aluminium Alloy.....	207
<i>V. Kumar and L. Bichler</i>	
Properties of AlZn10Si8Mg Alloys for High Performances Application.....	213
<i>M. Rosso, I. Peter, C. Castella, and R. Molina</i>	

Processing, Texture and Formability

An Experimental and Modeling Investigation on High-Rate Formability of Aluminum	221
<i>A. Rohatgi, R. Davies, E. Stephens, A. Soulami, and M. Smith</i>	
Influence of Chemical Composition and Process Parameters on Mechanical Properties and Formability of AlMgSi-Sheets for Automotive Application	227
<i>R. Prillhofer, J. Berneder, G. Rank, H. Antrekowitsch, S. Pogatscher, and P. Uggowitzer</i>	
High Strength Aluminum Brazing Sheets for Condenser Fins of Automotive Heat Exchangers.....	233
<i>K. Euh, H. Kim, and S. Kim</i>	
High-Temperature Processes Occurring during Homogenization of AA6082 Aluminum Alloy.....	237
<i>M. Cieslar, J. Bajer, M. Hájek, and V. Očenásek</i>	

Solutioning and Aging Behavior

A Study of the Artificial Ageing on the Low Temperature Creep of AlMgSi (AA6201) Wires	245
<i>B. Smyrak, T. Knych, A. Mamala, and K. Korzeń</i>	
Precipitates in Long Term Aging Al 5083 Alloy.....	249
<i>G. Yi, Y. Zhu, D. Cullen, A. Derrick, and M. Free</i>	
Effect of Modified Aging Treatments on the Tensile Properties, Quality Indices and Fatigue Life of Cast Components of Aluminum Alloy 354	255
<i>G. Babu and M. Rao</i>	
Effect of Vanadium Additions on the Structure of Aluminium (Al99.5) and 6xxx Aluminium Alloys.....	261
<i>L. Boczek, M. Lech-Grega, J. Morgiel, and K. Piela</i>	
Aluminum Tailor-Welded Blanks for High Volume Automotive Applications.....	265
<i>Y. Hovanski, P. Upadhyay, S. Pilli, B. Carlson, J. Carsley, S. Hartfield-Wunsch, and M. Eisenmenger</i>	

Corrosion and Fatigue

A New Approach for Evaluation of Fatigue Life of Al Wire Bonds in Power Electronics	273
<i>G. Khatibi, M. Lederer, B. Czerny, A. Kotas, and B. Weiss</i>	
Long and Small Fatigue Crack Growth in Aluminum Alloys	279
<i>A. Spangenberg, A. Gavras, and D. Lados</i>	
Alumina Silica Brick Corrosion by Different Aluminium Alloys.....	285
<i>G. Monsberger, C. Majcenovic, and G. Praseta</i>	
Effect of Salt Solution Corrosion on Tensile Properties of Vacuum High Pressure Die Cast A356 Alloy Subjected to Heat Treatment	293
<i>Y. Zou, H. Hu, P. Cheng, and Y. Chu</i>	
Effect of the Thermo-Mechanical Treatment on IGC Susceptibility of AA 5083 Alloy.....	297
<i>T. Radetić, A. Halap, M. Popović, and E. Romhanji</i>	

Material Characterization and Modeling

Role of Ni and Zr in Preserving the Strength of 354 Aluminum Alloy at High Temperature.....	305
<i>G. Garza-Elizondo, S. Alkahtani, A. Samuel, and F. Samuel</i>	
Stress-Strain Curves of Pure Aluminum and Al-4.5mass%Cu Alloy in Semi-Solid State.....	315
<i>N. Sakaguchi</i>	
Modeling Texture Evolution of Pure FCC Alloy during Annealing.....	319
<i>S. Huang, R. Zhang, and M. Li</i>	
Microstructure and Mechanical Properties of 3003 Aluminum Alloy with Mg and Ni Addition	323
<i>Z. Tang, Y. Pan, T. Lu, and Y. Lin</i>	

Lightweight Construction for Electric Mobility Using Aluminium	331
<i>A. Kleine, M. Rosefort, and H. Koch</i>	

Emerging Technologies

Deformation of Open-Cell Microcellular Pure Aluminum Investigated by the Acoustic Emission Technique	339
<i>M. Knapek, P. Dobroň, F. Chmelík, M. Zimina, J. Pešíčka, E. Combaz, and A. Mortensen</i>	
The Research on Process of Impact Factors of Hard Anodic Oxidation for 6061 Aluminum Alloy	343
<i>J. Wang, Z. Zhang, J. Sun, S. Huang, Y. Han, and J. Du</i>	
Using Scrap in Recycling Alloys for Structural Applications in the Automotive Industry	349
<i>W. Fragner, K. Baumgartner, H. Suppan, M. Hummel, D. Bösch, H. Höppel, and P. Uggowitzer</i>	
Residual Stress Analysis in Semi-Permanent Mold Engine Head Castings	355
<i>M. Walker, D. Hess, and D. Sediako</i>	
Tensile and Shear Mechanical Properties in a Thermo-Mechanical-Electrical Processed Spot Weld	359
<i>S. Turnage, K. Solanki, W. Whittington, R. Florea, M. Tschopp, and K. Darling</i>	
Development of High-Strength and Highly Ductile Hypo-Eutectic Al-Si Alloys by Nano-Refining the Constituent Phases	365
<i>M. Shamsuzzoha, L. Nastac, and A. Haque</i>	
Anodization and Optical Appearance of Sputter Deposited Al-Zr Coatings	369
<i>V. Gudla, S. Canulescu, R. Shabadi, K. Rechendorff, J. Schou, and R. Ambat</i>	

Poster Session

Friction Coefficients on Compression Testing of AA6060 and 42CrMo4 with Different Lubrication Conditions...	377
<i>S. Ataya and T. Emde</i>	
Effect of Tin on the Corrosion and Electrochemical Behavior of Al-Zn-Mg Alloy in Sea Water	383
<i>M. Sadawy and K. Zohdy</i>	
Interface Evolution in the Process of Fabricating Aluminum Foam Sandwiches.....	389
<i>H. Lin, H. Luo, W. Sun, and G. Yao</i>	
Alloy AlZn9 Casted in the Process of Rapid Solidification and Consolidated in the Process of Plastic Forming	393
<i>W. Szymanski, M. Szymanek, M. Gawlik, M. Bigaj, S. Boczekal, and B. Płonka</i>	

Aluminum Processing

Rolling & Twin Roll Casting

Evolution of Microstructure and Texture during Severe Cold Rolling and Annealing of Al-2.5% Mg and Al-2.5%Mg-0.2%Sc Alloys	401
<i>J. Gatti and P. Bhattacharjee</i>	
Dynamic Simulation of Internal Logistics in Aluminum Downstream Manufacturing.....	405
<i>A. Winkelmann, S. Brandal, S. Neumann, and J. Desjardins</i>	

Influence of the Twin-Roll Casting Parameters on the Microsegregation in Thin Strips of the Aluminium Alloy EN AW-6082	411
<i>O. Grydin, M. Stolbchenko, F. Nürnberger, and M. Schaper</i>	

Determination of Aluminum Rolling Oil and Machinery Oil Residues on Finished Aluminum Sheet and Foil Using Elemental Analysis and Fourier Transform Infrared Spectroscopy Coupled with Multivariate Calibration ..	415
<i>Ö. Uçar, H. Altuner, M. Günyüz, M. DüNDAR, and D. Özdemir</i>	

Extrusion & Miscellaneous Processes

A Numerical and Experimental Study of Homogenization of Al-Si-Mg Alloys	423
<i>P. Priya, M. Krane, and D. Johnson</i>	
Effect of Mg ₂ Si Phase on Extrusion of AA6005 Aluminum Alloy	429
<i>Y. Sun, D. Johnson, K. Trumble, P. Priya, and M. Krane</i>	
Analysis of the Evolution and Deformation of Pore Morphology during Compression.....	435
<i>L. Wei, T. Zhang, Y. Fang, and Y. Tian</i>	

Aluminum Reduction Technology

Potline Operations - Cell Operations

Cell Electrical Preheating Practices at DUBAL	445
<i>A. Arkhipov, A. Zarouni, M. Al Jallaf, I. Baggash, S. Akhmetov, M. Reverdy, and V. Potocnik</i>	
DUBAL Cell Voltage Drop Initiatives Towards Low Energy High Amperage Cells.....	451
<i>M. Bastaki, A. Zarouni, B. Jonqua, N. Ahli, L. Mishra, A. Al Jasmi, A. Al Zarouni, M. Reverdy, and V. Potocnik</i>	
Startup of Shut-Down Pots - Problems and Solutions to Improve Results.....	457
<i>D. Marinho, L. Fabri, and N. Gama</i>	
Thermal Events of the Early Life of an Aluminum Electrolysis Cell.....	461
<i>A. Ugron, L. Kiss, J. Bilodeau, and S. Guérard</i>	
Regulation System to Improve Quality of the Metal Sucked during Tapping Operation.....	467
<i>S. Bouchard, P. Canis, S. Despinasse, A. Hequet, P. Marchand, and F. Potvin</i>	
Key Success Factors Deploying a Manufacturing Excellence Solution (MESAL™) in Rio Tinto Alcan	471
<i>M. Chareyre and S. Boivin</i>	

Cell Design and Performance - Cathodes and Anodes Joint Session with Electrode Technology

Influence of the Cathode Surface Geometry on the Metal Pad Current Density	479
<i>M. Dupuis and V. Bojarevics</i>	
On the Influence of MHD Driven Convection on Cathode Wear.....	485
<i>K. Einarsrud, E. Skybakmoen, and A. Solheim</i>	
Effect of Innovative Cathode on Bath/Metal Interface Fluctuation in Aluminum Electrolytic Cell	491
<i>Q. Wang, J. Peng, B. Li, and N. Feng</i>	

Simulation and Optimization of Cathode Current Distribution to Reduce the Horizontal Current in the Aluminum Liquid	495
<i>W. Li, Y. Zhang, D. Chai, J. Yang, S. Qiu, and Y. Wang</i>	
Numerical Simulation of Full Life Cycle Cathode Assembly Performances for Design Optimization.....	501
<i>G. Cao, X. Zhang, and H. Zhang</i>	
Bar to Block Contact Resistance in Aluminum Reduction Cell Cathode Assemblies.....	507
<i>R. Beeler</i>	
Anode Rod to Beam Contact	511
<i>D. Molenaar and T. Kilpatrick</i>	
Towards Decreasing Energy Consumption of Aluminum Reduction by Using Anodes with Holes and Channels ..	517
<i>N. Feng, J. Peng, Q. Niu, L. Zhan, N. Kang, X. Liao, and X. Gong</i>	

Environment I

Comparing Different Measurement Approaches to Characterize All PFC Emissions	523
<i>S. Gaboury, A. Gosselin, P. Tremblay, and J. Marks</i>	
Anode Effect Phenomena during Conventional AEs, Low Voltage Propagating AEs & Non-Propagating AEs.....	529
<i>D. Wong, A. Tabereaux, and P. Lavoie</i>	
Monitoring of Continuous PFC Formation in Small to Moderate Size Aluminium Electrolysis Cells	535
<i>H. Åsheim, T. Aarhaug, A. Ferber, O. Kjos, and G. Haarberg</i>	
At-Line Analysis of Polycyclic Aromatic Hydrocarbons in Aluminium Primary Production	541
<i>O. Kjos, T. Aarhaug, B. Wittgens, and A. Brunsvik</i>	
Raw Gas Particles and Depositions in Fume Treatment Facilities in Aluminium Smelting.....	547
<i>H. Gaertner, A. Ratvik, and T. Aarhaug</i>	
The Nature of Particles and Fines in Potroom Dust	553
<i>D. Wong, N. Tjahyono, and M. Hyland</i>	
Predictive Tools in Evaluating Re-Entrainment of Exhausted Particulate in Different Ventilator Configurations for Different Heat Process Applications.....	559
<i>S. Baltuch and E. Baltuch</i>	
Economic and Environmental Alternative for Destination of Spent Pot Lining from Primary Aluminum Production.....	565
<i>B. Meirelles and H. Santos</i>	

Fundamentals - Chemistry

Improving XRD Analysis for Complex Bath Chemistries - Investigations and Challenges Faced.....	573
<i>N. Tjahyono, T. Groutso, D. Wong, P. Lavoie, and M. Taylor</i>	
Al ₂ O ₃ -Na ₃ AlF ₆ Man-Made Ledge Composites for Aluminum Electrolysis Cells.....	579
<i>X. Lv, C. Zhang, Y. Lai, Z. Tian, M. Jia, and J. Li</i>	
Structural Characterisation and Thermophysical Properties of the Side Ledge in Hall-Héroult Cells	585
<i>S. Poncsák, L. Kiss, R. St-Pierre, S. Guérard, and J. Bilodeau</i>	

The Melting Behaviour of Aluminium Smelter Crust	591
<i>Q. Zhang, M. Taylor, and J. Chen</i>	
Key Physical Properties of Smelter Grade Alumina.....	597
<i>S. Lindsay</i>	
Modeling the Behavior of Alumina Agglomerate in the Hall-Héroult Process	603
<i>V. Dassylva-Raymond, L. Kiss, S. Poncsak, P. Chartrand, J. Bilodeau, and S. Guérard</i>	
Wetting Characteristics of Cryolite-Based Melts on Spinel Substrate	609
<i>R. Mukhlis, M. Rhamdhani, G. Brooks, and K. McGregor</i>	

Environment II

Abart CDS - A New Compact Multi-Pollutant Pot Gas and Alumina Handling System	617
<i>S. Ose, A. Sørhuus, and G. Wedde</i>	
Development on Electrolytic Cell Gas Cooling.....	623
<i>A. de Gromard, C. Lim, E. Bouhabila, B. Cloutier, and M. Frainais</i>	
15 Years of GTC Operation at ALDEL: Long-Term Assessment of GTC Performance	629
<i>A. Folkers, J. de Weerd, P. Klut, E. Dupon, and E. Engel</i>	
Pot Gas Cooling Technologies	635
<i>P. Verbraak, T. Turco, P. Klut, E. Dupon, and E. Engel</i>	
Modelling HF Generation: The Role of Ambient Humidity.....	641
<i>Y. Yang, M. Hyland, C. Seal, and Z. Wang</i>	
Online Monitoring of Aluminium Primary Production Gas Composition by Use of Fourier-Transform Infrared Spectrometry.....	647
<i>T. Aarhaug, A. Ferber, O. Kjos, and H. Gaertner</i>	

Fundamentals - Modeling

On the Prediction of the Crust Evolution inside Aluminum Electrolysis Cells	655
<i>M. LeBreux, M. Désilets, A. Blais, and M. Lacroix</i>	
An Improved Finite Element Model for Thermal Balance Analysis of Aluminum Electrolysis Cells.....	661
<i>X. Cui, Y. Zhou, and J. Yang</i>	
A Modelling of Heat Losses in Aluminium Reduction Cell with Slotted Anodes	667
<i>S. Yang, J. Li, Y. Xu, H. Zhang, X. Lv, and M. Jia</i>	
AP60 Cell Start-Up: Thermal Electrical Mechanical Quarter Cell Model	673
<i>L. Hacini, J. Bilodeau, and Y. Caratini</i>	
A Numerical Approach for the Design of Anode Beam Mechanical Systems	679
<i>A. Schneider, O. Charette, and D. Richard</i>	
MHD Stability for Irregular and Disturbed Aluminium Reduction Cells.....	685
<i>V. Bojarevics and S. Sira</i>	
Revised Benchmark Problem for Modeling of Metal Flow and Metal Heaving in Reduction Cells.....	691
<i>J. Hua, C. Droste, K. Einarsrud, M. Rudshaug, R. Jorgensen, and N. Giskeodegard</i>	

Dynamic Simulation of Cell Voltage Resonance Effect in Aluminum Electrolysis Cell	697
<i>Y. Wang, J. Tie, G. Tu, S. Sun, R. Zhao, and Z. Zhang</i>	
Analysis of the MHD Instabilities in Reduction Cells with Lyapunov Method	703
<i>Y. Yang, S. Yao, and X. Yi</i>	

Potline Operations - Equipment

A Novel Design Criterion for Alumina Feeders in Aluminium Electrolysis Cells	711
<i>A. Solheim</i>	
Non-Linear Behavior of a Metallic Foam for the Reduction of Energy Losses at Electrical Contacts in the Aluminum Industry	717
<i>R. von Kaenel, J. Antille, M. Pillet, and M. Lindeboom</i>	
Influence of Heat Source Cooling Limitation on ORC System Layout and Working Fluid Selection: The Case OG Aluminium Industry	723
<i>Y. Ladam, M. Børgund, and E. Næss</i>	
Concept and Design of DUBAL Pot Start-Up Fuses	729
<i>A. Al Jasmi, A. Zarouni, L. Mishra, M. Bastaki, and V. Potocnik</i>	
A Novel Heat Recovery Technology from an Aluminum Reduction Cell Side Walls: Experimental and Theoretical Investigations	733
<i>Y. Barzi, M. Assadi, and H. Arvesen</i>	
On-Line Monitoring of Anode Currents: Experience at TRIMET	739
<i>A. Lützerath, J. Evans, and R. Victor</i>	
Startup and Tuning of Material Distribution System at Aluminium Smelter in Qatar	743
<i>J. Paepcke, A. Hilck, J. Sowah, V. Shroff, S. Kumar, and R. Jain</i>	

Fundamentals - Electrochemistry and New Processes

Mass Transfer Reactions Near the Cathode during Aluminium Electrolysis	749
<i>G. Haarberg and P. Cui</i>	
Current Efficiency in Aluminium Reduction Cells: Theories, Models, Concepts, and Speculations	753
<i>A. Solheim</i>	
Effect of Current Density and Phosphorus Species on Current Efficiency in Aluminum Electrolysis at High Current Densities	759
<i>R. Meirbekova, J. Thonstad, G. Haarberg, and G. Saevarsdottir</i>	
A Concept for Electrowinning of Aluminium Using Depolarized Gas Anodes	765
<i>T. Mokkelbost, O. Kjos, O. Paulsen, B. Øye, H. Gudbrandsen, A. Ratvik, and G. Haarberg</i>	
Investigations into Innovative and Sustainable Processes for the Carbothermic Production of Gaseous Aluminum	771
<i>E. Balommenos, P. Diamantopoulos, D. Gerogiorgis, D. Pantias, I. Paspaliaris, C. Kemper, L. Peters, B. Friedrich, I. Vishnevetsky, M. Epstein, M. Halmann, A. Haselbacher, Z. Jovanovic, and A. Steinfeld</i>	
A CFD-PBM Coupled Model Predicting Anodic Bubble Size Distribution in Aluminum Reduction Cells	777
<i>S. Zhan, M. Li, J. Zhou, J. Yang, Y. Zhou, and C. Zhou</i>	

Simulation of Anode Bubble: Volume of Fluid Method	783
<i>Y. Zhou, J. Zhou, J. Yang, W. Li, and S. Chen</i>	
EAF Carbothermic Co-Reduction of Alumina and Silica for the Direct Production of Al-Si Master Alloy	789
<i>C. Kemper, E. Balomenos, D. Pantias, I. Paspaliaris, and B. Friedrich</i>	

Cell Design and Performance

Preparation and Start-Up of Arvida Smelter, AP60 Technological Center	797
<i>R. Gariépy, A. Couturier, O. Martin, B. Allano, A. Machado, and F. Charmier</i>	
Industrial Running of the 530kA Potline in North-Western China.....	803
<i>X. Liang, X. Chen, L. Guo, J. Li, F. Ding, S. Liu, L. Ren, and Y. Liu</i>	
The End of an Era for Søderberg Technology in North and South America	809
<i>M. Barber and A. Tabereaux</i>	
Successful Start-Up of World Largest Greenfield Smelter.....	815
<i>S. Abdulla, R. Akhtar, and M. Al Qassemi</i>	

Potline Operations - Control

Understanding and Managing Alumina Quality Fluctuations to Minimise Impact on Cell Performance and Metal Quality	823
<i>M. Al-Jallaf, A. Louw, G. Meintjes, A. Kumar, D. Whitfield, M. Boraie, G. Hamad, K. Venkatasubramaniam, and A. Sergey</i>	
Developing a New Process Indicator Based on the Relationship Between an Electrolysis Cell Impurity Balance and Its Incidents.....	829
<i>L. Dion, L. Kiss, D. Lavoie, and J. Arvisais</i>	
New Generation Control for Daily Aluminium Smelter Improvement Generation 3 Process Control for Potlines ..	835
<i>A. Mulder, Y. Gao, D. Zhou, D. Wong, L. Ming, P. Lavoie, M. Taylor, and X. Yang</i>	
Current Status of Research and Development of Automatization and Intellectuality for Plants of Aluminum in China	841
<i>J. Li, J. Liu, D. Lu, J. Mao, Q. Yang, and G. Tu</i>	
Statistical Evaluation and Modeling of the Link between Anode Effects and Bath Height, and Implications for the ALPSYS Pot Control System	845
<i>S. Fardeau, A. Martel, P. Marcellin, and P. Richard</i>	

Cast Shop for Aluminum Production

Macroseggregation and DC Casting

Mechanisms and Control of Macroseggregation in DC Casting	855
<i>D. Eskin</i>	
Modelling of Micro- and Macroseggregation in Multicomponent Aluminium Alloys Accounting for Secondary Phase Formation	861
<i>K. Ellingsen, M. M'Hamdi, K. Tveito, and D. Mortensen</i>	

Macrosegregation Modelling of DC-Casting Including Grain Motion and Surface Exudation	867
<i>D. Mortensen, M. M'Hamdi, K. Ellingsen, K. Tveito, L. Pedersen, and G. Grasmø</i>	
A New DC Casting Technology for Extrusion Billets with Improved Surface Quality	873
<i>A. Håkonsen, J. Hafsås, and R. Ledal</i>	
An Innovative Automated Surface Inspection of DC Cast Billets.....	879
<i>P. Martin, R. Larouche, and J. Laurin</i>	
Impact of Cooling Water Composition on Heat Transfer in Ingot Casting	885
<i>D. Gildemeister</i>	
Neutron Diffraction Measurement of As-Cast Residual Stresses in AA7050 Rolling Plate Ingots: Influence of a Wiper	893
<i>J. Drezet, P. Celle, O. Ribaud, and T. Pirling</i>	

Recycling/Cast Shop

Life Cycle Assessment of Secondary Aluminium Refining	901
<i>G. Gilstad and J. Hammervold</i>	
A Material Flow Model for Impurity Accumulation in Beverage Can Recycling Systems	907
<i>A. Løvik and D. Müller</i>	
The Viability of a "Voluntary Refund-Deposit System" for Aluminum Can Recycling in the U.S.	913
<i>J. Buffington</i>	
Oxide Skin Strength Measurements on Molten Aluminum - Manganese Alloys with and without Salt on Surface	919
<i>M. Syvertsen</i>	
Oxidation of Manganese-Containing Aluminum Alloys.....	925
<i>S. Wilson, A. Kvithyld, G. Tranell, and T. Engh</i>	
Development of a Sampling Device for Furnace Dross	931
<i>A. Kvithyld, S. Bao, A. Nordmark, M. Syvertsen, M. Schlesinger, and A. Johansson</i>	

Grain Refinement/Solidification

Grain Refinement of Aluminium Alloys: Recent Developments in Predicting the As-Cast Grain Size of Alloys Refined by Al-Ti-B Master Alloys	939
<i>M. Easton, D. StJohn, and A. Prasad</i>	
A Comparison of the Effects of Al-Ti-B Type Grain Refiners from Different Makers on Pure Aluminum	945
<i>W. Dai, X. Wang, W. Zhao, and Q. Han</i>	
Improved Grain Refinement of AA6060 Extrusion Billets	951
<i>J. Courtenay, I. Klauke, R. Vainik, G. Esposito, and M. Rosefort</i>	
On the Performance of a Novel Grain Refiner in Hyper-Eutectic Al-Si Cast Alloys.....	957
<i>L. Bolzoni, M. Nowak, and N. Babu</i>	
Analysis of Boron Treatment for V Removal Using AlB ₂ and AlB ₁₂ Based Master Alloys	963
<i>A. Khaliq, M. Rhamdhani, G. Brooks, and J. Grandfield</i>	

The Effect of Trace Levels of Ni and V on the Microstructure and Properties of Four Common Aluminum Alloys	969
<i>J. Grandfield, L. Sweet, A. Beer, S. Zhu, X. Chen, and M. Easton</i>	
Evaluation of Functional Properties of the Rapidly Solidified Cast AlSi30 Alloy as a Material for Transport Applications.....	975
<i>B. Augustyn, M. Szymanek, D. Kapinos, M. Nowak, and W. Pakiel</i>	
The Near-Rapid Solidification Behavior of AA1070 Aluminum Alloy	981
<i>Y. Liu, L. Zhang, Y. Zhao, J. Wang, and C. Liu</i>	

Furnaces and Energy

Computational Analysis of Thermal Process of a Regenerative Aluminum Melting Furnace	989
<i>J. Wang, Y. Zhou, H. Yan, and J. Zhou</i>	
Electromagnetic Stirring in Melting Furnaces - A Critical Evaluation.....	997
<i>A. Buchholz, G. Rombach, and G. Gruen</i>	
Sampling Tool for In-Depth Study of Furnace Processes.....	1003
<i>S. Instone, M. Badowski, and D. Krings</i>	
Transient Properties of Refractory Castable with Hydraulic Binders.....	1009
<i>M. Maaroufi, C. Diliberto, A. Lecomte, O. Francy, and P. Le Brun</i>	
A Novel Method of Online Measurement to Develop Specific Heating-Up Procedures for Industrial Furnaces ...	1015
<i>T. Schemmel, G. Thieser, N. Pfitzner, and U. Kremer</i>	

Metal Treatment

20 Years of LiMCA Utilization in the Aluminum Industry: A Review of the Technology Development and Applications.....	1021
<i>T. Buijs, D. Gagnon, and C. Dupuis</i>	
Clean Aluminum Processing: New Avenues for Measurement and Analysis	1025
<i>S. Hudson and D. Apelian</i>	
Metallurgical Performance of Salt and Chlorine Fluxing Technologies in Casting Furnaces	1031
<i>M. Badowski, S. Instone, and M. Hagen</i>	
Metal Cleanliness Evaluation of Reusable Ceramic Foam Filters.....	1037
<i>D. Chesonis, E. Williams, L. Gendreau, and L. Clément</i>	
Parallel Laboratory and Industrial Scale Aluminium Filtration Tests with Al ₂ O ₃ and SiC Based CFF Filters	1041
<i>M. Syvertsen, A. Kvithyld, S. Bao, A. Nordmark, and A. Johansson</i>	
New Developments of the I-60 SIR Melt Refining Unit	1047
<i>T. Haugen, A. Håkonsen, J. Fagerli, and M. Jönsson</i>	
A New Vacuum Degassing Process for Molten Aluminum	1051
<i>J. Zeng, B. Wu, Z. Hu, L. Wang, and D. Cao</i>	

General Cast Shop

Development and Demonstration of a Molten Metal Cooling Trough to Improve Casthouse Performance	1057
<i>A. Larouche, F. Borel, and J. Crépeau</i>	
Commissioning and Start-Up of Ingot Casting Machines in the Biggest Integrated Aluminum Complex in the World.....	1063
<i>A. Al-Garni, D. Humphreys, K. Al-Azmi, N. Al-Shammari, and K. Sundaram</i>	
Preventing Explosions in Maintenance Pits Under Furnaces	1067
<i>A. Lowery</i>	
The Effect of Magnesium Supply on the Quality of Aluminum Melts.....	1071
<i>H. Drieling and D. Chesonis</i>	
Effects of Microstructure and Defects on Tensile and Fracture Behavior of a HPDC Component: Potential Properties and Actual Outcome of EN AC-44300 Alloy.....	1077
<i>M. Zamani, S. Seifeddine, and A. Jarfors</i>	
Thermal Parameters Analysis during Directional Solidification of Al-Cu Eutectic Alloys	1083
<i>A. Kociubczyk, F. Cabello, C. Schvezov, and A. Ares</i>	

Electrode Technology for Aluminum Production

Anode Raw Materials

Impurity Level Distribution in GPC and CPC and Impact on Anode Properties.....	1093
<i>L. Edwards</i>	
Determination of Contact Angle from Raw Material Properties Using Linear Multivariable Analysis	1099
<i>A. Sarkar, D. Kocafe, Y. Kocafe, D. Bhattacharyay, B. Morais, and C. Lagacé</i>	
Use of Coal Tar Pitch Coke for Producing Prebaked Electrodes.....	1105
<i>S. Gao, C. Bao, B. Xia, R. Lin, J. Woo, G. Lang, and E. Cutshall</i>	
Characterization of Dry Aggregates in Carbon Anodes by Image Analysis.....	1111
<i>D. Bhattacharyay, D. Kocafe, Y. Kocafe, A. Sarkar, B. Morais, and J. Chabot</i>	

Paste Plant Operations

Characterization of Packing Ability of Coke Particles	1117
<i>K. Azari, A. Hussein, H. Alamdari, D. Ziegler, and M. Fafard</i>	
Texture Analysis of Anode Paste Images	1123
<i>J. Lauzon-Gauthier, C. Duchesne, and J. Tessier</i>	
High Temperature Compression Test to Determine the Anode Paste Mechanical Properties.....	1129
<i>S. Thibodeau, H. Chaouki, H. Alamdari, D. Ziegler, and M. Fafard</i>	
Viscoplastic Modeling of the Green Anode Forming Process.....	1135
<i>H. Chaouki, S. Thibodeau, H. Alamdari, D. Ziegler, and M. Fafard</i>	
Characterization of Homogeneity of Green Anodes through X-Ray Tomography and Image Analysis.....	1141
<i>K. Azari, B. Majidi, H. Alamdari, D. Ziegler, and M. Fafard</i>	

Field Experience with the Buss Kneader Type KX: Highest Quality and Throughput Targets Attained.....	1147
<i>H. Siegenthaler and C. Hauser</i>	
Maximizing Green Anode Slots Height through a Rigorous Methodology and Finite Elements Modeling	1151
<i>J. Abeille, P. Sornin, Y. El Ghaoui, P. Contard, A. Gagnon, F. Moralès, M. Gagnon, and F. Fruleux</i>	
High Performance of "Eolios" Pitch Fume Treatment System.....	1157
<i>S. Sendid and A. Courau</i>	

Bake Furnace Design and Operation

Improving Fuel Gas Injection in Anode Baking Furnace	1165
<i>P. Mahieu and P. Sedmak</i>	
Anode Baking Furnace Firing System Lean Engineering	1171
<i>P. Contard, C. Bayard, Y. El Ghaoui, Y. Foster, F. Ordronneau, P. Sulzberger, E. Altmann, R. Grange, J. Lhuissier, and P. Noraz</i>	
Effect of Heating Rate on the Crack Formation during Baking in Carbon Anodes Used in Aluminum Industry ...	1175
<i>S. Amrani, D. Kocaefe, Y. Kocaefe, B. Morais, and G. Blaney</i>	
Structured Approach to Modernization of Fume Treatment Centers.....	1181
<i>E. Dupon, E. Engel, R. Oliana, B. Admiraal, and P. Klut</i>	
Upgrade of an Existing Fume Treatment Plant at Aluar to Cope Higher Production in the New Open Type Anode Baking Furnaces.....	1187
<i>E. Cobo, L. Beltramino, J. Artola, F. Heinke, D. Maiwald, and D. Di Lisa</i>	

Anode Quality and Performance

An Approach to Help Control Air Permeability of Pre-Baked Anodes.....	1195
<i>S. Zhang, W. Li, and J. Jiang</i>	
Optimising Anode Performance in DUBAL Reduction Cells	1199
<i>E. Mofor, S. Akhmetov, T. Sahu, J. Blasques, D. Whitfield, G. Meintjes, K. Rajwinder, A. Jassim, S. Rabba, H. Devadiga, and K. Al Aswad</i>	
Paste Production and Its Performance in Søderberg Smelters	1203
<i>M. Meier and R. Perruchoud</i>	
Study of Manufacturing Technology for High Quality Anodes	1209
<i>Q. Zhao, J. Zhao, and Q. Zhao</i>	
Understanding Anode Overpotential	1213
<i>R. Thorne, C. Sommerseth, A. Svensson, E. Sandnes, L. Lossius, H. Linga, and A. Ratvik</i>	

Cathode Materials and Wear

Room Temperature Creep Behaviour of Ramming Paste Baked at Different Temperatures	1221
<i>P. St-Arnaud, D. Picard, H. Alamdari, D. Ziegler, and M. Fafard</i>	

Characterisation of the Material Behaviour of Cathode Steel Collector Bar at High Temperatures and Low Stress Levels.....	1227
<i>F. Fakoya, D. Picard, G. Gauvin, H. Alamdari, R. Beeler, and M. Fafard</i>	
Cartography and Chemical Composition of the Different Deposits in the Hall-Heroult Process.....	1233
<i>F. Allard, M. Coulombe, G. Soucy, and L. Rivoaland</i>	
Interaction of Sodium Vapor and Graphite Studied by Thermogravimetric Analysis.....	1239
<i>Z. Wang, A. Ratvik, E. Skybakmoen, and T. Grande</i>	
N-SiC Side Lining - Variations of Materials Structure.....	1245
<i>A. Yurkov, O. Danilova, and A. Dovgal</i>	

Rodding Operation and Anode Electrical Connections

Improving Energy Efficiency at Albras: A Case Study in the Rodding Shop.....	1253
<i>P. de Vasconcelos, M. Vasconcellos, and J. Nunes</i>	
ARTS - Anode & Rod Tracking System - A New Tool for Optimization of Anode Performance.....	1259
<i>I. Grle, A. Harwardt, and M. Beilstein</i>	
Anode Rodding Basics.....	1263
<i>D. Molenaar and B. Sadler</i>	
Anode Electrical Resistance Measurements: Learning and Industrial On-Line Measurement Equipment Development.....	1269
<i>G. Léonard, S. Guérard, D. Laroche, J. Arnaud, S. Gourmaud, M. Gagnon, M. Chollier, and Y. Perron</i>	
Automated Crack Detection Method Applied to CT Images of Baked Carbon Anode.....	1275
<i>D. Picard, J. Lauzon-Gauthier, C. Duchesne, H. Alamdari, M. Fafard, and D. Ziegler</i>	
Development of a New Methodology to Measure Contact Pressure along a Thermo-Electro-Mechanical Interface.....	1281
<i>M. Emami, D. Marceau, and M. Désilets</i>	
Rodding in Hall-Héroult Cells: An FEA Model that Predicts Room Temperature Mechanical Properties and Cracking Tendency of Thimbles.....	1287
<i>D. Gunasegaram and D. Molenaar</i>	
Temperature Fitting Method for Predicting Equidistant Voltage Drop of Anode Rod in Aluminum Reduction Cell.....	1293
<i>J. Li, G. Tu, X. Qi, J. Liu, H. Dong, and Y. Zhang</i>	

Inert Anodes, Cathode Design and Alternative Processes

Effect of La on the Electrolysis Performance of 46Cu-25Ni-19Fe-10Al Metal Anode.....	1301
<i>W. Peng, Y. Liu, J. Guo, R. Zhao, J. Yang, and W. Li</i>	
Evaluation of a Pre-Oxidation Treatment for Limiting Electrolyte Penetration in Cu-Ni-Fe Anode during Al Electrolysis.....	1305
<i>G. Goupil, E. Gavrilova, B. Davis, D. Guay, and L. Roué</i>	
Inert Anodes: An Update.....	1309
<i>R. Pawlek</i>	

Investigating the Corrosion Behaviors of Fe-Ni-Cr Anode Material for Aluminum Electrolysis	1315
<i>Z. Wang, J. Xue, L. Feng, and F. Dai</i>	
The Metal Phase Selection of 10NiO-NiFe ₂ O ₄ -Based Cermet Anodes for Aluminum Electrolysis	1321
<i>H. He</i>	
Study on the Anode and Cathode Configuration of Aluminum Reduction Cell.....	1327
<i>Y. Ban, Y. Mao, J. Mao, J. Liu, and X. Yang</i>	
Study on Cathode Structure Optimization of Aluminum Reduction Cell.....	1333
<i>Y. Ban, Y. Mao, J. Mao, J. Liu, and X. Yang</i>	

Light-Metal Matrix (Nano)-Composites

Microstructure-Property Relationships I

Effect of Process Control Agent on the Microstructure and Mechanical Behavior of an Aluminum and B ₄ C Metal Matrix Composite.....	1343
<i>C. Hofmeister, A. Giri, S. Brennan, Y. Sohn, T. Delahanty, and K. Cho</i>	
Microstructure and Damping Properties of Ultra Fine Grained Al Wires Reinforced by Al ₂ O ₃ Nanoparticles	1347
<i>R. Casati, M. Vedani, A. Tuissi, E. Villa, D. Dellasega, X. Wei, and K. Xia</i>	
Elevated Temperature Deformation Behavior of High Strength Al-Cu-Mg-Ag Based Alloy Reinforced by TiB ₂ Particles	1353
<i>M. Indriyati, V. Janik, and R. Dashwood</i>	

Microstructure-Property Relationships II: Modeling and Advanced Characterization

Understanding the Role of Nanodispersions on the Properties of A390 Hyper-Eutectic Al-Si Cast Alloy.....	1361
<i>I. El Mahallawi, O. Othman, M. Abdelaziz, H. Raed, T. El-Fatah, and S. Ali</i>	
Phase Formation and Mechanical Properties of Al-Mg-Mn-Ti-B-Zr-Sc Composite Material	1367
<i>N. Belov, E. Kurbatkina, and A. Alabin</i>	
Physico-Mechanical and Electrical Properties of Aluminum-Based Composite Materials with Carbon Nanoparticles	1373
<i>S. Vorozhtsov, D. Eskin, A. Vorozhtsov, and S. Kulkov</i>	
Contactless Acoustic Wave Generation in a Melt by Electromagnetic Induction	1379
<i>G. Djambazov, V. Bojarevics, B. Lebon, and K. Pericleous</i>	
Brownian Motion Effects on the Particle Settling and Its Application to Solidification Front in Metal Matrix Composites	1383
<i>J. Ferguson, B. Schultz, P. Rohatgi, and C. Kim</i>	
X-Ray Tomography and Small-Angle Neutron Scattering Characterization of Nano-Composites: Static and In Situ Experiments	1389
<i>S. Terzi, R. Daudin, J. Villanova, P. Srirangam, P. Lhuissier, L. Salvo, E. Boller, R. Schweins, P. Lindner, J. Blandin, P. Lee, and H. Lemmel</i>	

Emerging Processes

The Physical-Mechanical Properties of Aluminum Nanocomposites Produced by High Energy Explosion Impact.....	1397
<i>S. Vorozhtsov, A. Vorozhtsov, S. Kulkov, and V. Komarov</i>	
Processing of Metal Matrix Composites under External Fields and Their Application as Grain Refiner	1401
<i>E. Djan, S. Madam, N. Babu, J. Tamayo-Ariztondo, D. Eskin, and Z. Fan</i>	
Grain Refinement and Nanoparticle Dispersion Using Traveling Magnetic Field.....	1405
<i>M. Garrido, Y. Fautrelle, L. Davoust, V. Bojarevics, K. Pericleous, M. Megahed, and O. Koeser</i>	
Nanoparticles Distribution and Mechanical Properties of Aluminum-Matrix Nano-Composites Treated with External Fields.....	1411
<i>J. Tamayo-Ariztondo, S. Madam, E. Djan, D. Eskin, N. Babu, and Z. Fan</i>	
Manufacturing of Nano-Surface AA7075 Composites by Friction Stir Processing	1417
<i>M. Ahmed, M. Refat, and I. El-Mahallawi</i>	

In-Situ Synthesis and Novel Additions

Novel Ultrafine-Grained Aluminium Metal Matrix Composites Prepared from Fine Atomized Al Powders.....	1425
<i>M. Balog, F. Simancik, P. Krizik, M. Nosko, W. Rajner, M. Walcher, and M. Qian</i>	
The Structure, Phase Composition and Mechanical Properties of Hot Pressed Metal Matrix Nanocomposites Al-Al ₄ C ₃	1431
<i>S. Vorozhtsov, A. Vorozhtsov, and S. Kulkov</i>	
Mechanical Properties of Aluminium-Based Nanocomposite Reinforced with Fullerenes.....	1437
<i>K. Choi, S. Shin, D. Bae, and H. Choi</i>	
The Effect of Mechanically Exfoliated Graphene Dispersion on the Mechanical Properties of Aluminum/Graphene Composites.....	1441
<i>S. Shin and D. Bae</i>	
Development of Al/C ₆₀ Composites with Nano-Network Structures	1443
<i>H. Choi and D. Bae</i>	

Addendum

Light Metals 2013

AlTi5B1 Grain Refiners on the Casting of DIN 226 Aluminum Alloys	1449
<i>O. Yucel, C. Yapıcı, and A. Turan</i>	
Author Index.....	1453
Subject Index	1461

PREFACE

My late father spent his 30-year working life at the Comalco Bell Bay aluminium smelter as a crane driver, anode setter, tapper, metal scheduler, and cast shop and reduction foreman. His positive reports of and faith in the industry are the reason I studied metallurgy. My undergraduate degree was supported by a Comalco Aluminium living allowance, and Comalco Research Centre fostered my research and development skills. I now teach, consult, and research aluminium and magnesium metallurgy globally. I feel a strong debt of gratitude to an industry that enabled my father to support his family and for myself to build a rewarding career. It pleases me greatly to have the opportunity to give something back to the industry by organising the Light Metals sessions and editing the *Light Metals 2014* proceedings.

The meeting and the proceedings come about through the considerable efforts of authors and presenters, session chairs, and subject chairs (Ian Duncan, André Proulx, Margaret Hyland, Eddie Williams, Kai Karhausen, Dmitry Eskin, Wim Sillekens, and Zhengdong Long), ably and cheerfully supported by TMS staff. My sincere thanks to all concerned. A big thank you also goes to our current Aluminum Committee chair Barry Sadler for his guidance and support. My thanks also go to the organisers of a number of short courses held in conjunction with the meeting.

Recently, I helped compile a volume in the TMS *Essential Readings in Light Metals* collection. Going through almost 50 years of *Light Metals* papers brought home just what a momentous collection of key papers *Light Metals* contains. This year's collection is in the same league and will prove immensely useful, covering the full value chain, from bauxite to final products and alloys.

Effective technology management remains the primary source of industry improvement and competitive advantage. The Light Metals sessions and proceedings are an important part of achieving safe, low environmental impact, sustainable, productive, and profitable aluminium smelting and processing. *Light Metals* is the preeminent and essential technology reference work and resource for our industry.

The Light Metals program reflects the truly global nature of the aluminium industry. The international industrial community, including company, government, and academic researchers and technologists, mixes and mingles at the meeting, and out of such a melting pot, truly great ideas and innovations can arise.

The continued investment companies make by sending staff to the TMS Annual Meeting gives excellent returns. I commend that ongoing investment in these difficult times. Although the situation remains challenging for the industry with high inventory, low prices, reduced demand and overcapacity, the long-term outlook remains positive. Our industry has a crucial role in fuel-efficient transport, packaging, and infrastructure and is of great benefit to humanity. Meetings like those that offer these Light Metals symposia are an essential mechanism for maximising that benefit, a benefit my father would have been proud of.

John Grandfield
Editor

EDITOR'S BIOGRAPHY



JOHN GRANDFIELD LIGHT METALS 2014 EDITOR

John Grandfield is director of Grandfield Technology Pty Ltd, a consulting and technology firm, and adjunct professor at Swinburne University of Technology in the High Temperature Processing Group. He has a bachelor of applied science in metallurgy (RMIT), a M.Sc. in mathematical modeling (Monash University), and a Ph.D. in materials science (University of Queensland).

Dr. Grandfield has 30 years' experience in light metals research and technology in smelting, continuous casting, and metal refining (Rio Tinto Alcan, CASTerc and CSIRO). He has conducted plant benchmarking audits, technology reviews, optimized existing technology, managed technology transfer, and developed and commercialized new casthouse technologies. He remains active in research with a current focus on trace elements.

His work on direct chill and ingot casting of aluminum and magnesium has been awarded both internationally and within Australia. He is regularly invited to give training courses, participate in in-house innovation workshops, and conduct R&D program reviews around the world.

Dr. Grandfield has four patents, has published two book chapters and more than 50 conference and journal papers, and has co-authored a book on DC casting of light metals. He is a member of the TMS Aluminum Committee.

PROGRAM ORGANIZERS

ALUMINA AND BAUXITE



Ian Duncan is Director for Light Metals based in Perth, Western Australia, with responsibility for managing the Hatch bauxite and alumina team. This team is the basis of Hatch's center of excellence for bauxite and alumina and has responsibility for providing technical input and developing business opportunities on Australian and international alumina projects with a key focus on projects in South East Asia, Middle East and South America.

Ian has been with Hatch for 16 years, and during that time has had a variety of project and business development roles. His project roles include engineering management and study management roles on projects at the Worsley Alumina Refinery, the Global Alliance Coordinator for the Alcoa-Hatch Engineering Alliance, Refinery Area Manager for the Chalco Aurukun Feasibility Study, and Project Sponsor for the recently completed Shaheen Alumina Pre-Feasibility Study. Ian's business experience includes developing opportunities in Vietnam, China, Indonesia, and Australia and for the provision of consulting services on bankable/due diligence studies and financial analyses to government and non-government companies.

Prior to joining Hatch, Ian provided engineering, business development and project management expertise for projects in iron and steel, industrial minerals, natural gas and railways (civil/mechanical).

ALUMINUM ALLOYS: DEVELOPMENT, CHARACTERIZATION AND APPLICATIONS



Zhengdong (Steven) Long is Senior Alloy Development Engineer at Kaiser Aluminum in Spokane, Washington, United States.

He has more than 15 years' experience in aluminum and special alloys development and applications in the aerospace and automotive industries. He has been active for more than a decade in the areas of physical and mechanical metallurgy of metallic material. Dr. Long's diverse experience includes casting, thermo-mechanical processing, mechanical properties, fatigue, and corrosion behaviors. He specializes in microstructure characterization, thermodynamic and kinetic material modeling, casting and rolling process modeling. His principle research interests are in the development of industrial processes for manufacturing. He has two patents to his credit and more than 30 published papers.

Dr. Long received his doctorate in materials science and engineering from Central Iron and Steel Research and Institute in Beijing, China, in 2000.



Subodh Das is the founder and CEO of Phinix, LLC, an international light metals research and development company. Dr. Das is a recognized global thought leader in the area of aluminum recycling. He has founded six research companies and consortia. He has served on the TMS Board of Directors and was awarded the prestigious TMS Distinguished Service Award. He was awarded the *JOM* Best Paper Award in 2011.



Tongguang Zhai is an associate professor in the Department of Chemical and Materials Engineering, University of Kentucky, and an adjunct professor at Shandong Jianzhu University. Dr. Zhai has a bachelor's degree of science in metal physics (Beijing University of Science and Technology) and a Ph.D. in materials science (University of Oxford).

Dr. Zhai's research interests include alloy design, property-microstructure relationships, crystallographic texture, fatigue damage, 3-D simulation of short fatigue crack growth based on a microstructure-based model, and failure analysis. He has published more than 100 technical articles in materials science, mostly on aluminum alloys. His research has been sponsored by US-NSF, DOD, and industry.

Dr. Zhai serves as a key reader for *Metallurgical and Materials Transactions A*, and has organized and co-organized symposia on aluminum alloys and fatigue at TMS meetings.



Xiyu Wen has been a senior research associate for the Center for Aluminum Technology, College of Engineering, University of Kentucky and a materials engineer in Secat, Inc. since 2002.

He was a 1983 graduate of the Jilin University in P. R. China with a B.S. in physics. He was a faculty member for three years at the Northeast Heavy Machinery Institute, P. R. China. In 1989, Dr. Wen obtained M.S. in Materials Science from Yanshan University in P. R. China, where he worked again in Teaching and Research in Materials Science. Dr. Wen received his Ph.D. from the Hong Kong Polytechnic University in 2000.

His research focuses on the physical and mechanical metallurgy mainly concerned with textures and microstructures of metal materials/sheet metal forming, and he assists undergraduate, graduate, and post-graduate students in their research. His main work is conducting research and development, providing technical assistance to the aluminum industries.