

Proceedings

European Metallurgical Conference
Emc 2017
June 25 - 28
Leipzig, Germany

Volume 3

Aluminium
Light Metals (Mg, Li, Ti)
Copper
Refractory Materials
Economic Prospects and Trading
Environmental Protection

The European Metallurgical Conference is organized by



Editor

GDMB

Paul-Ernst-Straße 10, 38678 Clausthal-Zellerfeld, Germany

Internet: www.GDMB.de

EMC 2017 Volume 1: ISBN 978-3-940276-72-8

EMC 2017 Volume 2: ISBN 978-3-940276-73-5

EMC 2017 Volume 3: ISBN 978-3-940276-74-2

EMC 2017 Volume 4: ISBN 978-3-940276-75-9

Set EMC 2017, V 1 – 4: ISBN 978-3-940276-76-6

All rights reserved. No part of this publication may be reproduced or electronically processed, copied or distributed without the prior consent by the editor.

The content of the papers is the sole responsibility of the authors. All papers were peer reviewed by selected members of the scientific committee or rather the chairmen of the conference.

Editorial staff: Ulrich Waschki

Production and marketing: GDMB Verlag GmbH

Printed by: Oberharzer Druckerei

© GDMB

Clausthal-Zellerfeld 2017

Bibliographische Information Der Deutschen Bibliothek

Die Deutsche Bibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliographie; detaillierte bibliographische Daten sind im Internet über <http://dnb.ddb.de> abrufbar.

Bibliographic information published by Die Deutsche Bibliothek

Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliographie; detailed bibliographic data is available in the internet at <http://dnb.ddb.de>.



Structure of the Proceedings

- Volume 1:
 - Precious Metals
 - Recycling / Waste
 - Process fundamentals, modelling and new processes
 - Improving of Alloys

- Volume 2:
 - Lead
 - Nickel / Cobalt / Vanadium
 - Minor Metals
 - General Pyrometallurgy
 - General Hydrometallurgy
 - Strategies for Resource Savings
 - HSE practices and Legal Aspects

- Volume 3:
 - Aluminium
 - Light Metals (Mg, Li, Ti)
 - Copper
 - Refractory Materials
 - Economic Prospects and Trading
 - Environmental Protection



- Volume 4:
 - Strategic Metals Recovery Technologies
 - Secondary Metallurgy
 - By-product Treatment
 - Slag
 - Simulation and Model Calculations
 - Process Control
 - Zinc
 - Analytics
 - Poster
 - Authors Index
 - Keywords Index



Table of Contents – Volume 3

Aluminium

Investigation of Temperature Effect on Impurities' Distribution Coefficient
in Molten Aluminum through Theoretical Calculation and Experimental
Fractional Crystallization 889

Dr.-Ing. Semiramis Friedrich, Dipl.-Ing. Danilo Curtolo,
Prof. Dr.-Ing. Dr. h.c. Bernd Friedrich

Aluminium Production Wastes Managements 897

Dr. M. Maccagni, Dr. E. Guerrini, J. Nielsen

Thermodynamic Analysis on Reaction Abilities of Structural Units
in Fe–Al Binary Melts Based on the Atom and Molecule Coexistence Theorys 907

Xue-min Yang, Jin-yan Li, Fang-jia Yan, Dong-ping Duan

Light Metals (Mg, Li, Ti)

Implications when alloying Magnesium into Aluminium melt 931

T. Doppler, H. Antrekowitsch, H. Boettcher, W. Fragner

Titanium extraction from red mud via hydrometallurgical treatment 943

Gözde Alkan, Claudia Schier, Dr. Srecko Stopic, Prof. Bernd Friedrich

Chlorination Kinetics of an Ilmenite
Concentrate and Sequential Characterization of Obtained Materials 949

Ludy Margarita Montero, Carlos Augusto Queiroz, Natasha Suguihiro,
Rodrigo Souza, Rogério Navarro, Guillermo Solorzáno, Eduardo Brocchi

Assessment of a lithium ore to determine its amenability to processing
for the extraction of lithium 961

Mark G. Aylmore, Kelly Merigot, William D. A. Rickard, Noreen J. Evans,
Bradley J. McDonald, Enej Catovic, Peter Spitalny



Copper

| | |
|--|------|
| Development on Cu Smelters in China Today Yan Jie | 985 |
| ISASMELT™ Process for Direct-to-Blister Copper Smelting Paul Voigt, Alistair Burrows, Michael Somerville, Dr. Chunlin Chen | 995 |
| Discussion on Copper Matte Continuous Converting Li Chunmeng, Shen Dianbang, Bai Wen | 1003 |
| Innovations in Pyrometallurgical Pre & Post Copper Flash Smelter Removal of Arsenic T. Beisheim, A. Charitos, J. Güntner, M. Wrobel, J. Hammerschmidt, H. Storch, L. Hedstrom | 1013 |
| Distribution of Ni, Co, Ag, Au, Pt, Pd between Copper Metal and Silica Saturated Iron Silicate Slag Dmitry Sukhomlinov, Pekka Taskinen | 1029 |
| FAQs about Operating a Cu ER Tankhouse above 400 A/m ² using the METTOP-BRX Technology Andreas Filzwieser, Iris Filzwieser, Stefan Wallner | 1039 |
| The influence of temperature, electrolyte composition and additive concentrations on physical properties of copper electrolytes Dipl.-Ing. Vrauke Heinze, Prof. Dr.-Ing. Michael Stelter | 1053 |
| Slurry Cooling Towers Implementation at Cobre Las Cruces Hydrometallurgical Plant C. Frias, E. Delgado, L. Lerin, L. Pastor | 1065 |



| | |
|---|------|
| Anode slime leaching: the impact of process parameters on the dissolution of Cu, Ni, Se and Ag | 1081 |
| Katja Weichert, Thorsten Preiß, Harald Kadereit, Peter Stantke, Günther Leuprecht | |
| New Drying Procedure for Decopperized Anode Slimes at Aurubis AG in Hamburg | 1087 |
| Peter Stantke | |
| Recovery of Metals from Anode Slime Containing High Sn | 1097 |
| K. Jiang, H. Wang, Y. Wang, K. Xie | |
| Pressure leaching of copper concentrate | 1107 |
| Grzegorz Pietek, Zbigniew Szolomicki, Katarzyna Leszczyńska-Sejda, Mateusz Ciszewski | |
| Flue dust from the copper converter process – Recovery of Cu and In by solvent extraction | 1121 |
| Dipl.-Ing. Philipp Rädercker, Prof. Dr.-Ing. Christiane Scharf, M. Sc. Philipp Zürner, Juniorprof. Dr. Gero Frisch, Dipl.-Min. Gunther Pieplow, Dipl.-Ing. (FH) Doreen Lindner Dr. Jörg Koch | |
| Recovery of Metals from Solid Wastes in Copper Smelter | 1133 |
| Kaixi Jiang, Haibei Wang, Yufang Wang, Xiaoping Zou | |
| Bioleaching of Copper from WEEE by <i>Acidithiobacillus ferrooxidans</i> and Acidophilic Mixtures from AMD | 1143 |
| MSc. Solange Kazue Utimura, MSc. Carlos G. Alvarez Rosário, PhD. Jorge A. Soares Tenório, PhD. Denise C. Romano Espinosa | |
| Cu isotope fractionation during prehistoric smelting – a contribution of modern pyrometallurgy | 1153 |
| Thomas Rose, Sabine Klein, Gunter Morgenstern, Michael Stelter | |
| RHI's Possibilities for Copper and Wire Producing Applications | 1169 |
| A. Franzkowiak, S. Breyner | |
| <i>Proceedings of EMC 2017</i> | XIX |



Examination of the flash smelting slag decoppering process kinetics 1185
Piotr Madej, Józef Czernecki, Tomasz Sak, Grzegorz Krawiec, Łukasz Kortyka, Katarzyna Klejnowska, Bogusław Onderka, Piotr Palimąka

Microstructure and properties of ultra high strength high-alloyed and quasi-equiatomic Cu-Al-Mn alloys 1201
Igor Altenberger, Stefanie Heinrichs, Hans-Achim Kuhn

The determination of 3D phase diagrams of the $\text{Cu}_2\text{O}_x\text{-ZnO-SiO}_2$ system 1211
Dr. Longgong Xia, Prof. Zhihong Liu, Prof. Pekka Taskinen

Refractory Materials

Effect of Zinc on Refractories in Metallurgical Vessels 1223
Dr. Dean Gregurek, DI Stefanie Redik, Dr. Christine Wenzl, Ing. Alfred Spanring

Advances in FeNi Rotary Kiln Linings 1235
Christine Wenzl, Bernhard Handle, Nestor Garcia

Economic Prospects and Trading

Trends in Nonferrous Metals Production in Europe, 2002 through 2014 1247
Elena Safirova, Sinan Hastorun, Graham Lederer

Can recycling of NdFeB magnets be expected in Europe before 2030? 1263
Prof. Dr.-Ing. Tobias Elwert, M. Sc. Matthias Hoffmann, Dipl.-Ing. Sabrina Schwarz

Environmental Protection

Environmental Protection and Environmental Footprint in Copper Production 1279
Dr. Karin Hinrichs-Petersen, Daniela Cholakova, Dr. Jörn Mühlenfeld



| | |
|--|------|
| Process simulation and environmental footprint of gold chlorination and cyanidation processes | 1293 |
| Heini Elomaa, Lotta Rintala, Mari Lundström | |
| Scope of application of fabric filters for the separation of particulate and gaseous pollutants from gases | 1311 |
| Dipl.-Ing. Rüdiger Margraf, Dirk Band | |
| Outotec Developments in Reducing Emissions from Solution Cooling Towers | 1331 |
| Tuomas Hirsi | |
| Reduction of Odor Emissions from Pyrometallurgical Metals Recovery from Secondary Raw Materials | 1339 |
| K. Jaworek, J. Mrozowski, M. Bąk | |