Proceedings

European Metallurgical Conference

EMC 2019

June 23 - 26
Düsseldorf, Germany

Volume 4

III Sustainable Production
Developments in Environmental Protection
Quality Assurance

IV Themes of current issues / Best Practices
Improving of Alloys / Powder Metallurgy and 3-D Print
Foundry – Casting / Refractory Materials
Economic Prospects and Trading
HSE practices and Legal Aspects / Industry 4.0

IV Poster

V Authors Index / VI Keywords Index

The European Metallurgical Conference is organized by
Structure of the Proceedings

- Volume 1:
  - I Resources / Metals
    - Light Metals
    - Copper
    - Lead
    - Zinc
    - Precious Metals
    - Nickel / Cobalt / Vanadium
    - Minor Metals
  - II Materials Processing
    - Raw Material Handling
    - Process Control

- Volume 2:
  - II Materials Processing
    - Process Fundamentals, Modelling and Simulations
    - Upgrading processes and handling of Impurities
    - General Pyrometallurgy
    - General Hydrometallurgy
    - New Processes
  - III Sustainable Production
    - Recycling / Waste
    - Strategic Resource Saving and Metals Recovery Technologies
    - Secondary Metallurgy
    - By-product Treatment
    - Slag
• Volume 4:

• III Sustainable Production
  Developments in Environmental Protection
  Quality Assurance
  Analytics

• IV Themes of current issues / Best Practices
  Improving of Alloys
  Powder Metallurgy and 3D Print
  Foundry – Casting
  Refractory Materials
  Economic Prospects and Trading
  HSE practices and Legal Aspects
  Industry 4.0

• V Poster
• VI Authors Index
• VII Keywords Index
### Table of Contents – Volume 3

#### III Sustainable Production

**Developments in Environmental Protection**

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of Zero Liquid Discharge (ZLD) technologies for water reuse in a copper smelter</td>
<td>1343</td>
</tr>
<tr>
<td>Ignacio Martín García, Jesús Salinero, Alberto Mejía Pérez, Irene Ruiz Oria, Guillermo Ríos Ransanz</td>
<td></td>
</tr>
<tr>
<td>Removal of Selenium as Selenate from High Sulfate Brine Waste Waters</td>
<td>1359</td>
</tr>
<tr>
<td>Dr. Joseph Grogan, Mr. James Dahlstrom, Mr. Benjamin Rodrigue</td>
<td></td>
</tr>
<tr>
<td>Heat Recovery in Fluidized Bed Applications</td>
<td>1373</td>
</tr>
<tr>
<td>Dr. J. Grünig, Dr. C. Olbricht, Dr. L. Perander, T. Hensler, Dr. C. Binder, K.-H. Daum</td>
<td></td>
</tr>
<tr>
<td>ILTEC – Mettop’s Revolutionary and Safe Cooling Solution</td>
<td>1389</td>
</tr>
<tr>
<td>Dr. Martina Hanel, Dr. Andreas Filzwieser, Dr. Hans-Jörg Krassnig, Dr. Rolf Degel</td>
<td></td>
</tr>
<tr>
<td>Efficiency increase and cost savings by electricity production from waste heat</td>
<td>1399</td>
</tr>
<tr>
<td>Julian Lechner</td>
<td></td>
</tr>
<tr>
<td>A new kinetic model for zinc ion removal from synthetic wastewater</td>
<td>1409</td>
</tr>
<tr>
<td>Fatemeh Sadat Hoseinian, Bahram Rezai, Mehdi Safari</td>
<td></td>
</tr>
<tr>
<td>A pilot study for treatment and thickening of wastewater from sintering dust dechlorination</td>
<td>1417</td>
</tr>
<tr>
<td>Marcin Stec, Krzysztof Slowik, Tomasz Iluk, Andrzej Czaplicki</td>
<td></td>
</tr>
<tr>
<td>High pressure carbonation of olivine</td>
<td>1431</td>
</tr>
<tr>
<td>Dr. Srecko Stopic, Christian Dertmann, Moritz Sievers, Prof. Ichiro Koiwa, Dr. Pol Knops, Prof. Bernd Friedrich</td>
<td></td>
</tr>
</tbody>
</table>
Quality Assurance

Robot-assisted replacement of the refractory components of the ladle sliding gate in a steel shop
Dr. Valentina Colla, Ruben Matino, Andrea Faes, Dr. Lea Romaniello, Antonius Schröder

Quality of casting and heat treatment processes – an information transfer approach
Dan Dragulin

Quality is designed not controlled
Gunther Schober, Dr. Joachim Gnauk

Analytics

Rheo-SANS: feasibility to characterize concentrated polydisperse colloidal particle suspensions
Dr. Akira Otsuki

High Sensitivity Nanoscale Characterization by Local Electrode 3-D Atom Probe Microscopy
Dr.-Ing. Urban Rohrmann, Dipl.-Ing. Konrad Güth, Dipl.-Ing. Jürgen Gassmann, Prof. Dr. Rudolf Stauber

Ultra-trace Elemental Analysis of Pure Metals and Quantitative Depth Profile Analysis in Coated Materials by Glow Discharge Mass Spectrometry
Dr. Myint Myint Sein, Peter Glörfeld, Dr. Joachim Hinrichs
IV  Themes of current issues / Best Practices

Improving of Alloys

Effect of Forward Extrusion on Mechanical Properties of Al-10Pb-4.5Cu Alloy 1519
Prof. Dr. Adnan Naama Abood, Ass. Prof. Dr. Ali Hassan Saleh, Ass. Lecturer Kadhum Jassem Wadi

Microstructure analysis and mechanical properties of the copper after laser surface treatment 1529
Dr. Justyna Domagała-Dubiel, Dr. Wojciech Głuchowski, Dr. Damian Janicki, Prof. Zbigniew Rdzawski, Dr. Aleksander Kowalski, M. Sc. Katarzyna Bilewska

Precipitation hardened Copper-Niobium wire 1541
Hans-Achim Kuhn, Dragoslav Vucic-Seele, Lisa Gericke, Igor Altenberger, Judith Bayerl, Marcin Wojcicki

Influence of heat treatment on hardening of CrMnFeCoNi high-entropy alloy with micro-segregation 1555
PhD. Toru Maruyama, Ir. Kazuki Takashima

Carbonyl Processing of Ferronickel Alloy 1563
Haikuo Sun, Yuerong Li, Liyu Lu

Powder Metallurgy and 3-D Print

Analytical insight for optimizing metal powder processing 1575
Debbie Huck-Jones, Cathryn Langley, John Duffy, Nicholas Norberg
Foundry – Casting

Conti-M® technology: smart solution for the high efficient production of Cu-OFE strip
Olaf Schwedler, Hendrik Busch

Refractory Materials

Furnace Integrity of electric furnaces – symbiosis of process, cooling, refractory lining and furnace design
Dr. Andrew van Niekerk, Dr. Rolf Degel, Dr. Andreas Filzwieser, Timm Lux

Economic Prospects and Trading

GERRI – Potentials and opportunities for German raw material actors
Feldhaus, D.; Büttner, P.; Köpf, H.; Rasenack, K.; da Silva, J. D.; Carlos A.

HSE practices and Legal Aspects

Safer frother option for sustainable oxidized coal beneficiation by froth flotation
Dr. Akira Otsuki, Tamara Miller

Industry 4.0

Industry 4.0 in the Metallurgy
Prof. Dr. jur. Walter Frenz, Maître en Droit Public
Industry 4.0 – From automated device data collection to asset health
Steffen Ochsenreither, Jens Hundrieser

Digitalization to Maximize Performance of Metallurgical Roasting Plants
Dipl.-Ing. Marcus Runkel, Dr. Steffen Haus, M.Sc. Sakari Kauvosaari, Dr. Jörg Hammerschmidt

Production Planning is the most efficient solution for process control
Gunther Schober, Robert Jaeger

V Poster

Rapid Routine Metallographic Analysis using Guided Machine Learning
Dr. Roger Barnett

Stability of H$_2$O$_2$ in hydrochloric acid medium in presence of Cu$^{2+}$ ions
Tamara Ebner

Single- and multi-stage leaching of metal containing waste
Eva Gerold

Pyrometallurgical recycling of Ta
Dominik Hofer, Stefan Luidold, Tobias Beckmann
Reclaiming valuable metals from process residues through the HIsarna ironmaking process
Dr. Timothy Kerry, Dr. Evangelos Georgakopoulos, Mr. Ashkan Hosseini, Dr. Erik Offerman, Dr. Yongxiang Yang

Tungsten reclamation from PDC bits
Claudia Kerschbaumer, Stefan Luidold, Thomas Wolfe, Anthony Smith

BizMet: Competitive Sustainable Business from Metal Recycling – BizMet Academy

Spent Pot Lining – CYCLE – novel zero waste technology
Ebin B, Petranikova M., Klinar D., Mladenovic A., Angelopoulos P., Grossman K., Roeland G., Halilovic M., Davris P.
Modeling of Refractory Corrosion by

Thermodynamic Simulation
Christoph Sagadin, Stefan Luidold, Christoph Wagner, Christoph Pichler and Alfred Spanring

Development of a zero-waste technology to convert residues into products
Dipl.-Ing. Walter Schatzmann, Priv.Doz. Dipl.-Ing. Dr.mont. Jürgen Antrekowitsch

Evaluation of lab scale production routes for aluminum alloys
Dipl.-Ing. Lukas Stemer, Dipl.-Ing. Florian Schmid

Scrap processing in Al recycling
Stefan Wibner, Helmut Antrekowitsch

Proceedings of EMC 2019
VI  Authors Index  1717
VII Keywords Index  1727