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**X-Ray Diffraction Analysis of Dynamic Transformation during High-Temperature Deformation of Niobium Steel**

*Clodualdo Aranas, University of New Brunswick*

*Samuel F. Rodrigues, Federal Institute of Maranhao*

*Fulvio Siciliano, Dynamic Systems Inc.*

*John Jonas, McGill University*

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**Materials Characterization of M789 Steel Produced by Means of Laser Powder Bed Fusion**

*Clodualdo Aranas, Robert Palad, and Kanwal Chadha, University of New Brunswick*

*Yuan Tian, voestalpine Additive Manufacturing Center Ltd.*

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**Formation of Strain Induced Ferrite and its Retransformation above the  $Ae_3$  under Plate Rolling Conditions**

*Samuel F. Rodrigues, Federal Institute of Maranhao*

*Fulvio Siciliano, Dynamic Systems Inc.*

*Clodualdo Aranas, University of New Brunswick*

*Eden S. Silva and Gedeon S. Reis, Federal Institute of Maranhao*

*John Jonas, McGill University*

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**An Investigation of the Effects of Welding Parameters on the Properties of Thin-Wall Pieces of Al-Si Alloy Made Using GMAW-Based Wire Arc Additive Manufacturing**

*Tan Pham and Mehdi Gharagozloo, École de technologie supérieure*

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**Is Cold Spray Additive Manufacturing?**

*Stephen Yue, McGill University*

*Phuong Vo, National Research Council Canada*

*Wilson Wong*

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**Hybrid Investment Casting**

*Abdoul-Aziz Bogno, Mubashir Chand Tamboli, Ahmed Qureshi, and Hani Henein, University of Alberta*

Paper 836927

**How Additive Manufacturing Changes Material Properties**

*Hadi Mozaffari-Jovein, Dennis Pedo, Emre Özel, Mo Li, and Tobias Poleske, Furtwangen University*

Paper 836991

**Influence of Additive Manufacturing and Subsequent Treatments on the Corrosion Behaviour of Different Titanium Alloys**

*Dennis Pedo, Mo Li, Tobias Poleske, and Hadi Mozaffari-Jovein, Furtwangen University*

## **MATERIALS: Corrosion & Degradation**

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**Corrosion Protection with Thermal Sprayed Zinc Duplex Coatings**

*Martin Gagne, ZELIXIR Inc.*

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**Topographic and Crystallographic Analyses of Hydrogen-Related Fracture Surfaces in Notched Tempered Martensitic Steel**

*Muhammad Zakuan and Kenichi Takai, Sophia University*

*Kensuke Iwanaga, Tsukasa Okamura, and Norio Tanaka, Neturen Co., Ltd*



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**Quantitative Evaluation of Strain-Induced Lattice Defects Enhanced by Hydrogen in Pure Iron**

*Kenichi Takai and Yuri Sugiyama, Sophia University*

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**Mass Transfer of Oxygen in Powder Coatings in Wet Diffusion Systems**

*Hossein Zargar and Edouard Asselin, University of British Columbia  
Dennis Wong and Catherine Lam, ShawCor Ltd.*

Paper 819698

**Microbiologically Influenced Corrosion (MIC) in an Operating Gold Mine**

*Muan Wei, ICE Dragon Corrosion Inc.  
Noelia Díaz, Barrick*

Paper 820385

**Finite Element Analysis (FEA) Study of Microstructural Influences on Hydrogen Embrittlement (HE) of High Strength Martensitic Steels**

*Tuhin Das and Rohan Chakrabarty, McGill University  
Salim V. Brahim, IBECA Technologies Corp.  
Stephen Yue, McGill University*

Paper 824644

**Effect of Surface Treatment on Corrosion Control of Fe-Cr and Fe-Cr-Ni Alloys in Hydrothermal Liquefaction Processing of Biomass**

*Joey Kish, McMaster University  
Yimin Zeng, Natural Resources Canada - CanmetMATERIALS  
Elliott K. Asare, McMaster University*

Paper 831664

**Comparison of the Corrosion of Wrought and Electron Beam Melted Ti-6Al-4V for Biomedical Applications**

*Mohammadali Shahsavari and Edouard Asselin, University of British Columbia*

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**The Passivity of Ti-45Nb Alloy in Sulfuric Acid in the Presence of Fluoride**

*Amin Imani and Edouard Asselin, University of British Columbia*

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**Rust Never Sleeps: Uncovering the Hidden Business Risks from Physical Asset Degradation**

*Zoe L. Coull, ICE Dragon Corrosion Inc.*

# **MINERAL PROCESSING: Novel Technologies for Environmental Footprint Reduction**

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## **Ferric Leaching of Pyrrhotite Tailings under Controlled pH And ORP Using Different Ferrous Oxidizers**

*Dazhi Ren, Georgiana Moldoveanu, Radhakrishnan Mahadevan, Elizabeth A. Edwards, and Vladimiro G. Papangelakis, University of Toronto*

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## **Plant-Wide Economic Model Predictive Control Application in Mineral Processing**

*Alex Thivierge, Jocelyn Bouchard, and André Desbiens, Université Laval*

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## **Developing a Phenomenological Dynamic Model for Particle Flow in Wet Low-Intensity Magnetic Separation**

*Juan Sebastian Guiral-Vega, Université Laval - COREM*

*Jocelyn Bouchard and Éric Poulin, Université Laval*

*Laura Pérez-Barnuevo*

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## **Reprocessing of Historical Gold Mine Tailings in Nova Scotia Using Chloride Hydrometallurgy**

*Terry C. Cheng, CanmetMINING, Natural Resources Canada*

*Michael B. Parsons, Geological Survey of Canada, Natural Resources Canada*

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## **Turning Waste to Value: Selective Recovery of Rare Earth Elements from Coal Fly Ash with Ion Exchange Technologies**

*Mehdi Mostajeran, Jean-Michel Bondy, and Rory Cameron, Natural Resources Canada - CanmetMINING*

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## **Exploring the Potential Benefits of Considering Mineral Liberation Explicitly in Process Control**

*Edgar Manuel M. Pérez García, Jocelyn Bouchard, and Éric Poulin, Université Laval*

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## **CanMicro: Scaling up Microwave Technology for the Mining Industry**

*Erin R. Bobicki, Darryel Boucher, and John H. Forster, University of Toronto*

*Christopher Pickles and Adam Olmsted, Queen's University*

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## **Accelerated Carbonation of Natural Canadian Silicates (Kimberlite and Wollastonite) for CO<sub>2</sub> Sequestration**

*Rafael M. Santos, Ye Eun Chai, Salma Chalouati, Cibi Chakravarthy, and Hugo Fantucci, University of Guelph*

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**An Analytical Tool to Assess the Carbonation Potential of Mineral Deposits and Mining Wastes**

*Carlos Paulo, Ian Power, and Amanda Stubbs, Trent University  
Nina Zeyen and Sioban A. Wilson, University of Alberta*

Paper 818972

**Functionalized Biopolymer for Enhanced Metal Recovery in Froth Flotation Processes**

*Laura Benavides, Integrity Mining and Industrial  
Cameron Bruin, Base Met Labs*

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**A Comparison of Two Circuit Applications for Implementation of Coarse Particle Flotation**

*Eric B. Wasmund, Eriez Flotation Division  
Rafael Regino, Cozamin site, Capstone Mining Corporation  
Oscar Lopez, Eriez Flotation Division  
Hank Wong, Fluor Canada Ltd  
Kathy Adams, Paterson and Cooke  
Drew Hobert, Eriez Flotation Division*

Paper 819143

**Model Predictive Control – A Digital Transformation Initiative at Vale Long Harbour Processing Plant**

*Kevin S. Brooks, BluESP  
Michael Roy, Lindani Ntombela, Ryan Peterson, and Trevor Batstone, Vale  
Paul Yanchus, Hatch Ltd.*

Paper 819461

**Investigation of Ferrous Bio-Oxidation Kinetics in a Batch Bioreactor**

*Heping Shen, Vladimiro G. Papangelakis, Mingqing Yang, Georgiana Moldoveanu,  
Elizabeth A. Edwards, and Radhakrishnan Mahadevan, University of Toronto*

Paper 819694

**Application of Switchable Biopolymers to Mitigate Clay Minerals in Mineral Processing**

*Erin R. Bobicki and Nahid Molaei, University of Toronto*

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**Recovery of Battery Metals (Ni and Co) from Pyrrhotite Tailings**

*Rory Cameron, Natural Resources Canada - CanmetMINING  
Yves Thibault and Rolando Lastra, Natural Resources Canada  
Jean-Michel Bondy, Natural Resources Canada - CanmetMINING  
Doug Gould, Self*

Paper 819919

**Control Strategies with Environmental Benefits for Mineral Processing Operations**

*Carole Prévost and Marc Tardif, BBA Inc.*

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**Biodegradation of Diethylenetriamine and Metal-Diethylenetriamine Chelates**

*Erin R. Bobicki and Erin Furnell, University of Toronto*

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**Process Analytics and Machine Learning to Predict Arc Loss in an Electric Arc Furnace**

*Lee D. Rippon, Bhushan Gopaluni, and Ibrahim Yousef, University of British Columbia  
Behrooz Hosseini, Jean-Francois Beaulieu, and Carole Prévost, BBA  
Sirish Shah, University of Alberta*

Paper 820449

**Selective Heat Ore Treatment: Shaking up the Economics of Mineral Recovery**

*Tracy Holmes, Jenike & Johanson Ltd.  
Chris Dodds, University of Nottingham  
David Craig, Jenike & Johanson Inc.  
Andrew Batchelor and Sam Kingman, University of Nottingham  
Erin Legault, SGS Canada Inc.  
Mark Whetton, Teledyne e2v*

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**Mineral Process Dust Management, a Medium Range LiDAR for Fugitive Emissions Quantification**

*Jonathan Bernier, Rio Tinto  
Martin Allard, Institut National d'Optique*

Paper 826255

**Niobium Ore Carbonate Minerals Flotation without Desliming**

*Elves Matiolo, Hudson Couto, and Amanda Freitas, Centro de Tecnologia Mineral (CETEM/MCTIC)  
Joselito Silva and Andreia Camelo, Niobras - CMOC International  
Stephanie Sá, Centro de Tecnologia Mineral (CETEM/MCTIC)*

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**Development and Application of Lime-Free Flotation Separation of Pb-Zn-S in Mining Plants**

*Yun Chen, Hunan Institute of Engineering  
Ping Xiang, Hu'nan Huaqi Resources and Environment Science and Technology Development Co, Ltd.  
Dongsheng He, Wuhan Institute of Technology*

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**High Definition Sorting System Based on New XRT, Visible Light and IR Detection Technologies**

*Jacek Kolacz, Comex*

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**Numerical Modelling of Non-Newtonian High Density Slurries in Thickeners**

*Guilherme A. Lindner, University of British Columbia  
David N. Minson, MTP - MinTecProcess C & M Ltd.  
Sanja Miskovic, University of British Columbia*

# **PYROMETALLURGY: Rodney Jones Honorary Symposium on Chromite Processing**

Paper 807611

## **Practical Considerations in the Design of an Experimental Set-Up for Laboratory-Scale Investigation of Slag Freeze-Linings**

*Pieter J. Bezuidenhout, Mintek*

*Joalet D. Steenkamp, Mintek / University of the Witwatersrand*

*Quinn G. Reynolds, Mintek*

Paper 814752

## **The Role of Chromite in the Refractory Products**

*Dean Gregurek, Jürgen Schmidl, and Alfred Spanring, RHI Magnesita*

Paper 818915

## **Cr Oxidation in Ferrochrome Smelter Dusts from Pilot-Scale DC Arc Furnace**

*Eleanor J. Berryman and Dogan Paktunc, CanmetMINING, Natural Resources Canada*

*David Kingston, National Research Council Canada*

Paper 819647

## **Magnetic Fields in DC and AC Furnaces**

*Isobel McDougall and Piet Jonker, Tenova South Africa (Pty) Ltd*

*Bennie Henning, Bennie Henning Consulting*

Paper 819709

## **The Recovery of Ferrochrome from Chromite and Stainless Steel Production Wastes Using DC Plasma Smelting**

*Tim Johnson, Tetronics International*

Paper 820051

## **Chromite Ore Pellet Sticking and Fouling**

*Marc Duchesne and Nicole Bond, Natural Resources Canada*

Paper 820131

## **Ferrochrome Production from Ontario's Ring of Fire Chromite**

*Michael McCaffrey, Hatch Ltd.*

*Stephen Flewelling, Mark Baker, Ryan Weston, and Michael Desilets, Noront Resources Ltd.*

*Matthew Cramer, Hatch Ltd.*

Paper 821558

## **Effects of the Reducing Atmosphere of the Calcination Stage on the Sulfur Department in Ferronickel Production via RK-EF Process**

*Sahand Sarbishei and Leili Tafaghodi Khajavi, University of British Columbia*

Paper 824618

## **Responsible Chromite Mining in Ontario's Ring of Fire**

*Ryan Weston and Mark Baker, Noront Resources Ltd.*

Paper 825537

**Pilot Plant Smelting of Canadian and South African Chromite in a DC Furnace**

*Isabel J. Geldenhuys, Mintek*

Paper 825619

**Chromium Markets and Outlook for the 2020s**

*Nils R. Backeberg, Roskill Information Services*

Paper 825768

**Reduction of Synthetic Chromite with Methane**

*Vincent Y. Canaguier and Leiv Kolbeinsen, Norwegian University of Science and Technology*

Paper 825909

**Removal of Hexavalent Chromium by Means of Adsorption onto Chitosan and Chitosan/B-Cyclodextrin Beads from Cr-Contaminated Waters**

*Georgios Kolliopoulos, Université Laval*

*Tryfon Kekes and Constantina Tzia, National Technical University of Athens*

*Georgios Kolliopoulos, Université Laval*

Paper 826253

**Overfeeding in DC FeCr Smelting & Lessons Learned from the Aluminium Industry**

*Harmen Oterdoom and Johan Zietsman, University of Pretoria*

Paper 826533

**Phase Transitions and Microstructural Changes during Oxidation and Reduction of a Weathered Ilmenite Concentrate**

*Hossein Salehi, Norwegian University of Science and Technology*

*Stian Seim, TiZir Titanium and Iron*

*Leiv Kolbeinsen and Jafar Safarian, Norwegian University of Science and Technology*

Paper 827086

**New Technology Development in Pyrometallurgy - A Framework for Reliable and Sustained Progress**

*Johan H. Zietsman, Heine Weitz, and Nicole Sweeten, Ex Mente Technologies*

Paper 827256

**Leveraging Process Mineralogy for Integrated Management of Chromite Processing**

*Alessandro Navarra, McGill University*

*Felipe Peña, Universidad Católica del Norte*

*Tassos Grammatikopoulos, SGS Canada Inc.*

*Alain Kabemba*

# **PYROMETALLURGY: Third Novennial Symposium on New Technology Implementation**

Paper 814506

**90 MW 3 Electrode Furnace with an Electrically Islanded Power Plant Utilizing SPLC, SVC for Electrical Efficiency and Stable Operation in Shielded Arc and Immersed Arc Modes**

*Mohammad Sedighy and Yan Elksnis, Hatch Ltd.*

*Denis Shevchenko, Pronico S.A.*

*Dong Shen, Hatch Ltd.*

*Alexander Sherstobitov and Denis Pershin, Pronico S.A.*

Paper 819148

**Extraction of Copper from Copper-Cobalt Alloy by Molten Magnesium**

*Dawei Yu, Chunxi Zhang, Xueyi Guo, and Qinghua Tian, Central South University*

Paper 819367

**Uncovering and Managing Hidden Catastrophic Business Risks from Asset Corrosion in Mining**

*Zoe L. Coull, ICE Dragon Corrosion Inc.*

Paper 819765

**Market Challenges for Using Rare Earths to Treat Waste Streams**

*Mason R. Haneline, Neo Chemicals & Oxides*

Paper 819890

**Recent Advancements in Refractory Management Technology for Furnace Campaign Life Extension**

*Mitchell Henstock, Afshin Sadri, Winnie Ying, Blair Climenhaga, Joshua Barnard, and Maria Tibbo, Hatch Ltd.*

Paper 819986

**Metal processing R&D at CanmetENERGY-Ottawa**

*Marc Duchesne and Robin Hughes, Natural Resources Canada*

Paper 822016

**Laboratory and Pilot Scale Study for Mercury (I) Chloride Oxidation to Mercury (II) Chloride Using Sodium Hypochlorite Dissociation in an Acidic Medium**

*Francois X. Cardin and Charles Desroches, CEZinc*

Paper 825075

**Application of a Refractory Corrosion Model (RCM) –Simulation and Validation of the Model**

*Christoph Pichler, Christoph Wagner, and Daniel Kreuzer, RHI Magnesita*

*Christoph Sagadin and Stefan Luidold, Christian Doppler Laboratory for Extractive Metallurgy of Technological Metals*

Paper 825892

**The Effect of Aging on Refractory Thickness Calculations for Process Vessels and Furnaces**

*Afshin Sadri, Winnie Ying, Mitchell Henstock, and Blair Climenhaga, Hatch Ltd.  
Julia Allard, McGill University*

Paper 826223

**McNulty 4.0: Towards a Predictive Parametric Approach**

*Harmen Oterdoom, University of Pretoria*

Paper 826964

**A Semi-Quantitative Catastrophic Risk Likelihood Prioritization Framework for the Metallurgical Industry**

*Stefan Hlouschko and Matthew Cramer, Hatch Ltd.  
Martin Pergler, Balanced Risk Strategies Ltd.*

Paper 828414

**Catastrophic Risk Management of Tailings Storage Facilities**

*Karl H. Pearce, Johan DuToit, Aravind Raman, Carmen Bracho, Rafael Davila, Dan McEvoy, Winnie Chan, and Daniel Molina, Hatch Ltd.*