

INTERNATIONAL PROCESS METALLURGY SYMPOSIUM

in honor of Professor Kari Heiskanen

Metallurgy as a tool for challenges in circular economy



Aalto University
School of Chemical
Engineering



9 – 10 November 2021

**Aalto University School of Chemical Engineering
Department of Chemical and Metallurgical Engineering
Espoo, Finland**

Tuesday, November 9th, 2021, am

Time	Keynote Session Chair: Prof. Mari Lundström Room: Lumituuli
08:00	Registration + Coffee (Main Lobby)
08:55	Opening words, Prof. Mari Lundström , Aalto University, Finland
09:00	Prof. Jan Cilliers , Imperial College London, United Kingdom <i>LUNAR MINING IDEAS can TRANSFORM EARTH MINES</i> <i>Dry Mineral Processing for Space and Earth</i> -Onsite-
09:30	Hannele Vuorimies , Metso:Outotec, Finland <i>World needs metals and Kari Heiskanen</i>
10:00	Daniel Peltonen , Boliden Smelters, Sweden <i>Challenges when heading towards green metals</i> -Onsite-
10:30	Prof. Janne Laine , Aalto University, Finland <i>World changing Innovations in Aalto</i> -Onsite-
11:00	L U N C H

Tuesday, November 9th, 2021, pm

Time	Session 1 – Battery metals Chair: Dr. Anna Klemettinen Room: Lumituuli	Session 2 – Minerals Processing Chair: Prof. Rodrigo Serna Room: Kaleva
12:00	<p style="text-align: center;"><u>Session Keynote</u> Matti Hietanen, FMG, Finland <i>Strategies for Finnish battery metals production</i> -Onsite-</p>	<p style="text-align: center;"><u>Session Keynote</u> Prof. Urs Peuker, Freiberg University, Germany <i>Multidimensional particle characterization and separation</i></p>
12:30	<p>Hans Eric Melin, Circular Energy Storage Research and Consulting, United Kingdom <i>The actual life cycle of batteries</i> -Onsite-</p>	<p>Prof. Luis Cisternas, University of Antofagasta, Chile <i>Mineral processing design for the mines of the future</i></p>
12:50	<p>Dr. Martina Petranikova, Chalmers University, Sweden <i>Recent activities and achievements in battery recycling research at Chalmers</i> -Onsite-</p>	<p>Dr. Kathryn Hadler, Imperial College London, United Kingdom <i>Mineral processing on the Moon: A new challenge and new opportunities</i></p>
13:10	<p style="text-align: center;">Jaakko Savolainen, Fortum, Finland Towards improved battery metals recovery - Fortum's unique mechano-hydrometallurgical battery recycling process -Onsite-</p>	<p>Dr. Rodrigo Grau, Metso:Outotec, Finland <i>Evaluation of Flotation Circuits using a Novel Approach</i></p>
13:30	<p>Prof. Mari Lundström, Aalto University, Finland <i>Battery recycling in Finland from research point of view</i> -Onsite-</p>	<p>Dr. Robert Hartmann, Aalto University, Finland <i>Green chemical reagents in froth flotation</i> -Onsite-</p>
13:50	COFFEE BREAK	

Tuesday, November 9th, 2021, pm

Time	Session 1 – Battery metals Chair: Dr. Anna Klemettinen Room: Lumituuli	Session 2 – Minerals Processing Chair: Prof. Rodrigo Serna Room: Kaleva
14:20	Marja Rinne , Aalto University, Finland <i>Recycling credits in battery recycling</i> -Onsite-	Ian Flanagan , BASF, United Kingdom <i>The BASF Intelligent Mine powered by Intellisense.io</i>
14:40	Prof. Yongming Chen , CSU, China <i>The regulation and technology progress of battery recycling in China</i> -Online-	Markus Ekberg , FinnCobalt, Finland <i>FinnCobalt – traceable and responsible battery metals from the historical Outokumpu mining camp</i>
15:00	Simon Michaux , GTK, Finland <i>Battery Systems Evolution – the right battery in the right system</i> <i>Materials that regenerate</i> -Onsite-	Prof. Przemyslaw Kowalczyk , NTNU, Norway <i>Deep-sea minerals: challenges and opportunities</i>
15:20	Anna Vanderbruggen , Helmholtz Institute Freiberg, Germany <i>Characterization of black mass of battery waste</i> -Onsite-	Prof. Lev Filippov , Lorraine University, France Topic
15:40	Lasse Rautio , Tracegrow, Finland <i>Towards commercial solutions by innovations in the industry – academy interphase</i>	Rasmus Blomqvist , Fennoscandian, Finland <i>Supply Chain for Natural Graphite in the European Battery Market</i>
16:00	Prof. Emer. Kari Heiskanen's most glorious moments (@ Kaleva)	

Wednesday, November 10th, 2021, am

Time	Session 3 – Circular Economy of Metals Chair: Dr. Benjamin Wilson Room: Lumituuli	Session 4 – TOCANEM Chair: Prof. Ari Jokilaakso Room: Kaleva
8:30	<p><u>Session Keynote</u> Dr. Nani Pajunen, Sitra, Finland <i>Circular Economy – “hype word” or long-time development work?</i> -Online-</p>	<p><u>Session Keynote</u> Prof. Timo Fabritius, University of Oulu, Finland <i>Gasification of biochar for reduction purposes</i></p>
9:00	<p>Dr. David Peck, TU Delft, the Netherlands <i>Circular economy</i></p>	<p>Petri Latostenmaa, Boliden Harjavalta, Finland <i>Towards carbon neutral nickel smelting</i> -Onsite-</p>
9:20	<p>Arsi Saukkola, Kuusakoski, Finland <i>Hydrometallurgical recovery of secondary raw materials</i> -Onsite-</p>	<p>Prof. Zhihong Liu, CSU, China <i>Energy saving in China's copper smelting industry</i> -Online-</p>
9:40	<p>Prof. Rodrigo Serna, Aalto University, Finland <i>Engineering tools for metals circulation and dance to honor the excellence of Kari Heiskanen</i> -Onsite-</p>	<p>Prof. Ari Jokilaakso, Aalto University, Finland <i>Alternative reductants for non-ferrous slag cleaning</i> -Onsite-</p>
10:00	COFFEE BREAK	

Wednesday, November 10th, 2021, am

Time	Session 3 – Circular Economy of Metals Chair: Dr. Benjamin Wilson Room: Lumituuli	Session 4 – TOCANEM Chair: Prof. Ari Jokilaakso Room: Kaleva
10:20	Prof. Kerstin Forsberg , KTH, Sweden <i>Circularity of battery materials from a chemical engineering perspective</i>	Prof. Ulla Lassi , University of Oulu, Finland TOCANEM -Onsite-
10:40	Prof. Herman Potgieter , University of the Witwatersrand, South Africa <i>A comparison of various leaching and separation methods of Ti and Fe from ilmenite</i>	Prof. Yongxiang Yang , TU Delft, the Netherlands <i>Sustainable development towards carbon lean ironmaking and steelmaking</i> -Onsite-
11:00	Dr. Anna Klemettinen , Aalto University, Finland <i>Integrated metallurgical processing in research</i> -Onsite-	Jarmo Lilja , SSAB, Finland <i>SSAB Raahe Conversion to Fossil-free Steelmaking</i> -Onsite-
11:20	Dr. Lotta Rintala , VTT, Finland <i>Role of secondary streams in circular economy of metals</i>	Prof. Daniel Lindberg , Aalto University, Finland <i>Thermodynamic modeling as a tool in understanding carbon-free pyrometallurgical processes</i> -Onsite-
11:40	Dr. Esko Hakanen , Aalto University, Finland <i>Business models for circular economy</i>	Prof. Caisa Samuelsson , Luleå University of Technology, Sweden <i>Towards fossil free metallurgy - how can gaseous reductants be efficiently used for smelt reduction</i> -Onsite-
12:00	L U N C H	

Wednesday, November 10th, 2021, am

Time	Session 5 – EAST Forum Chair: Dr. Kirsi Yliniemi Room: Palaver
08:20	<u>EAST price ceremony</u> Dr. Liana Anicai , Politehnica University of Bucharest, Romania Prof. Peter Leisner , EAST President -Onsite-
08:30	EAST Award winner talk Konrad Eiler , Universitet Autònoma de Barcelona, Spain <i>Nanostructuring electrocatalyst materials by electrodeposition</i> -Onsite-
09:00	Dr. Jens Dahl Jensen , Siemens, Germany <i>On the road towards a renewable energy system: Challenges and achievements as seen from a (surface) technology perspective</i>
09:20	Prof. Luca Magagnin , Politecnico di Milano, Italy <i>Electroplating for energy storage as sustainable circular process</i>
09:40	Dr. Nevenka Elezovic , University of Belgrade, Serbia <i>Electrodeposited thin Platinum layers on Max phases based support for green energy power sources</i> -Online-
10:00	COFFEE BREAK

Wednesday, November 10th, 2021, am

Time	Session 5 – EAST Forum Chair: Dr. Kirsi Yliniemi Room: Palaver
10:20	<i>Prof. László Péter, Wigner Research Center for Physics, Hungary</i> <i>Pickling of stainless steels</i> -Onsite-
10:40	Teemu Tuovinen , Outokumpu, Finland <i>Stainless steel pickling</i> -Online-
11:00	Dr. Wolfgang Hansal , RENA Additive Manufacturing, Austria <i>Post-Processing 3D-gedruckter Metallbauteile</i>
11:20	<i>Prof. Karen Pantleon, Technical University of Denmark</i> <i>Electroplating of hard Fe-C alloys</i> -Onsite-
11:40	
12:00	LUNCH

Wednesday, November 10th, 2021, pm

Time	Session 5 – EAST Forum Chair: Dr. Peter Leisner Room: Palaver
13:00	Dr. Petteri Halli , Aalto University, Finland <i>Trace metal recovery via innovative electrochemistry</i> -Onsite-
13:20	Prof. Piotr Żabiński , AGH University of Science and Technology, Poland <i>Vanadium and other metals recovery from power plant fly ash</i> -Onsite-
13:40	Christine Enowmbi Tambe , University of Strathclyde, United Kingdom <i>Role of Boric Acid during Metal Electrodeposition</i>
14:00	Prof. Sudipta Roy , University of Strathclyde, United Kingdom <i>Industry 4.0 Electroforming</i>
14:20	
14:50	COFFEE BREAK
15:20	EAST Annual Meeting

Wednesday, November 10th, 2021, pm

Time	Session 6 – Base and Precious Metals Chair: Dr. Lotta Rintala Room: Lumituuli	Session 7 – Process Simulation Chair: Tuomas van der Meer Room: Kaleva
13:00	<p style="text-align: center;"><u>Session Keynote</u></p> <p style="text-align: center;">Dr. Oluf Bøckman, Glencore Nikkelverk, Norway <i>CROCODILE – a novel recycling cobalt process founded by H2020 and the potential integrations of the process into European metallurgical industries</i> -Onsite-</p>	<p style="text-align: center;"><u>Session Keynote</u></p> <p style="text-align: center;">Prof. Henrik Saxen, Åbo Academy, Finland <i>Simulation of DRI production by hydrogen reduction in a shaft furnace</i></p>
13:30	<p style="text-align: center;">Tor Stendahl, BASF, Finland <i>BASF battery materials as a part of Europe's sustainable battery value chain</i> -Onsite-</p>	<p style="text-align: center;">Prof. Inge Bellemans, Ghent University, Belgium <i>Phase field modelling</i> -Online-</p>
13:50	<p style="text-align: center;">Prof. Lena Sundqvist-Öqvist, Luleå University of Technology, Sweden <i>Hydrometallurgical recovery of lead, silver and tin from sulphate leach residues</i></p>	<p style="text-align: center;">Jani-Petteri Jylhä, Aalto University, Finland <i>Droplet coalescence and settling modelling in copper matte smelting</i> -Onsite-</p>
14:10	<p style="text-align: center;">Dr. Sami Virolainen, LUT University, Finland <i>Ion exchange in energy metals separations</i></p>	<p style="text-align: center;">Kezhou Song, Aalto University, Finland <i>CFD-modelling on bottom blown copper smelting furnaces with different tuyere arrangements</i> -Onsite-</p>
14:30	<p style="text-align: center;">Dr. Laura Nevatalo, Agnise Eagle, Finland <i>Gold production in Kittilä</i></p>	<p style="text-align: center;">Research Prof. Anssi Laukkanen, VTT, Finland <i>Refractories case from TOCANEM</i></p>
14:50	COFFEE BREAK	

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15:20	Prof. Longgong Xia , CSU, China <i>Progress on the Strengthening of Copper Recovery from the Smelting Slag</i> -Online-	Dr. Heini Elomaa , Metso:Outotec, Finland <i>HSC simulation and LCA analysis</i> -Onsite-
15:40	Mika Paalanne , Aalto University, Finland <i>Extract precious metals from low concentration solutions - novel electrochemical method</i> -Onsite-	Dr. Johan Zietsman , Ex Mente, South Africa <i>Modelling of freeze linings</i> -Online-
16:00	Dr. Justin Salminen , Boliden Kokkola, Finland <i>Strategies for future base metals production</i>	Prof. Ari Jokilaakso , Aalto University, Finland <i>Production processes modeling with modern techniques</i> -Onsite-
16:20	Prof. Zhiyong Liu , CSU, China <i>The oxidation of As(III) by pressurized oxygen and simultaneous precipitation of As(V) as scorodite in acidic sulfate solution</i> -Online-	