VIRTUAL TECHNICAL COURSES
PRIOR TO THE CONFERENCE

FRIDAY, SEPTEMBER 29TH
09:00AM – 12:00 PM(UTC-3)

COURSE 1: **UNLOCKING LITHIUM'S POTENTIAL: CHALLENGES AND OPPORTUNITIES IN THE EXTRACTION AND PRODUCTION PROCESS**
Kristy Nell, Research Fellow, University of Queensland, Australia; **James Vaughan**, Assistant Professor, University of Queensland, Australia; **Yahaira Barrueto**, Researcher, SMI-ICE-Chile; **Dennis Vega**, Researcher, SMI-ICE-Chile

Language: English and Spanish

FRIDAY, SEPTEMBER 29TH
03:00PM – 05:00PM (UTC-3)

COURSE 2: **BUILDING A WORKFLOW IN GEOMETALLURGICAL PREDICTION**
Sebastián Avalos, Principal Consultant, APMT Canada; **Julian Ortiz**, Associate Professor, Robert M. Buchan Department of Mining, Queen's University, Canada

Language: Spanish

MONDAY, OCTOBER 2ND
03:00PM – 05:00PM (UTC-3)

COURSE 2: **MINERAL-WATER-PHYSICOCHEMICAL-EQUIPMENT INTERACTIONS AND THEIR RELATIONSHIP WITH FLUID DYNAMICS IN CONCENTRATOR PLANT PROCESSES**
Leopoldo Gutiérrez, Professor, Department of Metallurgical Engineering, Universidad de Concepción, Chile

Language: Spanish

VIRTUAL TECHNICAL COURSE PROGRAMS

Course 1: Unlocking Lithium's Potential: Challenges and Opportunities in the Extraction and Production Process

When: September 29, 2023

Instructors: (1) Kristy Nell, Research Fellow, University of Queensland, Australia
(2) James Vaughan, Assistant Professor, Queensland University, Australia
(3) Yahaira Barrueto, Researcher, SMI-ICE-Chile
(4) Dennis Vega, Researcher, SMI-ICE-Chile

Language: English (1 and 2) and Spanish (3 and 4)

Length: 3 hours

Description: Initially, this course presents the impact of greenhouse gas emissions from mining and mineral processing, and highlights the importance of the need for critical minerals, such as lithium. This course offers a solid introduction to the processing of lithium minerals and brines to obtain lithium carbonate and lithium hydroxide, key components in the manufacture of lithium-ion batteries and other high-tech products. Participants will learn the fundamental processes used in the extraction, purification, and crystallization of lithium carbonate from brines, with a focus on the advantages and disadvantages of this methodology.

General Objectives:

- Objective 1: Understand greenhouse gas emissions in the mining industry and the importance of critical minerals for decarbonization
- Objective 2: Become familiar with the basic principles of processing spodumene to obtain lithium carbonate and lithium hydroxide
- Objective 3: Understand lithium recovery processes from lithium ion batteries
- Objective 4: Understand the process of concentration of lithium brine through solar evaporation
- Objective 5: Understand the methods for obtaining valuable products from the by-products generated during the process of solar concentration of brine
- Objective 6: Understand the process for obtaining lithium carbonate and lithium hydroxide from brine
- Objective 7: Assess the challenges and opportunities of direct lithium extraction (DLE) technologies

CONTENT AND PROGRAMME

09:00 – 09:40	Greenhouse emissions and the importance of critical minerals for the decarbonization	Kristy Nell
09:40 - 09:50	Questions and discussion	
09:50 - 10:30	Research and development in sustainable lithium production and recycling	James Vaughan
10:30 - 10:40	Questions and discussion	
10:40 - 10:50	Break 1	
10:50 - 11:20	Solar concentration of lithium brines and valorization of byproducts	Yahaira Barrueto
11:20 - 11:30	Questions and discussion	
11:30 - 11:50	Obtaining lithium carbonate from brines – Direct Lithium Extraction (DLE)	Dennis Vega
11:50 - 12:00	Questions, final conclusions and closing of the course	

Instructors BIO

Dr Kristy Nell (née Campbell): Research Fellow at Julius Kruttschnitt Mineral Research Centre (JKMRC) within the Sustainable Minerals Institute (SMI) at the University of Queensland University. She holds a bachelor's degree in Chemical Engineering from the North-West University (NWU), South Africa, and completed her PhD in the area of GHG emissions quantification in the ferrochrome industry at the CRCED (Centre for Research and Continued Engineering Development), at the NWU. Her main areas of interest include carbon emission monitoring and quantification as well as energy transition and integration within the mining industry.

Dr. James Vaughan: Associate Professor James Vaughan is the Metallurgy Major Lead and head of the Hydrometallurgy Research Group within the School of Chemical Engineering at the University of Queensland. I have obtained a Bachelor's degree in Metallurgical Engineering at McGill University followed by Master of Applied Science and PhD degrees in Materials Engineering at The University of British Columbia in Canada. James' research focuses on the fundamental aspects of leaching, ion exchange and precipitation reactions as well as membrane separations.

Dr. Yahaira Barrueto: Civil engineer in mineral processes from the University of Antofagasta and PhD in mineral process engineering from the same university. Her main area of expertise is green solvents applied in hydrometallurgy, electronic waste recycling and thermodynamic modeling of electrolytic systems. Within her areas of interest are the circular economy, environmental remediation and the thermodynamics of multicomponent systems.

Dr. Dennis Vega: Chemical Engineer from the University of Santiago de Chile and with a master's degree in waste treatment from the University of Stuttgart. He obtained his PhD from the Mineral Processing Group at Imperial College London, where he completed his PhD on optimizing hydrocyclone designs using computer simulations. His main areas of interest are mineral processing, solid-liquid separation and sustainable mining.

Course 2: Building a Workflow in Geometallurgical Prediction

When: Friday Sept 29, 2023
2:00 – 4:00 PM EST [Ontario, Canada] (3:00 -5:00 PM UTC -3h [Chile])

Instructors: Sebastian Avalos, Principal Consultant, APMT Canada

Julian Ortiz, Associate Professor, Robert M. Buchan Department of Mining, Queen's University

Language: Spanish (slides in English)

Length: 2 hours

Description: In this course, we will present a simple implementation example to build a workflow for geometallurgical prediction. We will provide a general framework, discuss different application examples, and focus on a particular example to demonstrate the implementation. An outlook and discussion about outstanding challenges will conclude the workshop.

GENERAL OBJECTIVES

- Build a simple prediction workflow
- Learn about different application examples
- Take home a fully implemented workflow in an example application

CONTENT AND PROGRAMME

15:00 - 15:45	Introduction: • An example workflow to predict in geometallurgy • Workflow components Review of examples	Julián Ortiz
15:45 - 16:30	Example implementation in Python	Sebastian Avalos

16:30 - 16:45	Q&A	
16:45 -17:00	• Outlook and challenges • Closing remarks	

LECTURER(S) BIO

Dr. Sebastian Avalos is a Mining Engineer and M.Sc. in Mining Engineering from Universidad de Chile, and Ph.D. in Mining Engineering from Queen's University with postdoctoral studies in multivariate geostatistical modeling and advanced mine planning. Currently, he is Principal Consultant at Advanced Predictive Modeling Technology (APMT), which operates with offices in Canada and Chile. He has supported the learning experience as adjunct professor, teaching fellow and teaching assistant on eleven courses at Queen's University and twelve at Universidad de Chile. With ten years of combined consulting and academic experience, he has contributed to the realization of 35 mining-related projects, 5 published peer-reviewed articles and over 12 papers in conference proceedings.

Dr. Julian Ortiz is a Mining Engineer from Universidad de Chile, and Ph.D. in Mining Engineering (Geostatistics) from University of Alberta. Currently, he is Head and Associate Professor at the Robert M. Buchan Department of Mining at Queen's University, where he teaches geostatistics and surface mining courses, and conducts research related to ore body estimation and simulation, and geometallurgical modelling. Previously, he worked as an Associate Professor at the Department of Mining Engineering at Universidad de Chile, where he was Head of the Department, from 2012 to 2014. He was also Deputy Director of the Advanced Mining Technology Center, and Director of ALGES lab, concerned with software development for ore body modeling. He has published over 50 peer-reviewed journal articles and more than 70 international conference papers. He has also been involved in training of professionals through many short courses in professional development programs and has participated as an expert consultant in over 100 mining projects.

Course 3: Mineral-Water-Physicochemical-Equipment Interactions and their Relationship with Fluid Dynamics in Concentrator Plants Processes

When: Monday, October 2nd, 03:00PM – 05:00PM

Instructors: Dr. Leopoldo Gutiérrez, Professor, Department of Metallurgical Engineering, Universidad de Concepción, Chile

Language: Spanish

Length: 2 hours

Description: Aspects related to the interactions between different groups of variables that control and define the efficiency of metallurgical processes in concentrator plants are addressed, particularly in flotation and thickening processes. Physical and chemical variables and their relationship with the fluid dynamic behavior of pulps (plural) processed in a concentrator plant are analyzed. Alternatives are proposed for the processing of complex minerals and developments for the future that allow the mining business to be sustainable.

CONTENT AND PROGRAMME

12:00 - 12:05	Bienvenida e Introducción al Curso	Coordinador(a) del Curso
Module 1 12:05 - 12:45	• Definitions • Aspects related to fluid dynamics and rheology of heterogeneous particulate systems, relevance in concentrator plants. • Physicochemical fundamentals of flotation and its impact on efficiency. • Mineralogical variables of interest, mineralogy impact on laboratory-plant scaling. • Flotation ratio upstream processes (grinding-classification) and downstream processes (thickening tailings-concentrate), filtration, overfoaming processes.	Leopoldo Gutiérrez

12:45 - 13:00	Q & A Module 1	Leopoldo Gutiérrez
Módulo 1 13:00 - 13:45	Some analysis cases: • Impact of water quality and its role in the efficiency of processes in the context of complex mineralogy. • Processing of fine particles. • Role of rheology in flotation-thickening-transportation of pulps. • Effect of recirculations and residual reagents (flocculants, lime, collectors), role of Geometallurgy of complex Minerals	Leopoldo Gutiérrez
13:45 - 14:00	Q & A Module 2	Leopoldo Gutiérrez

Instructors BIO

Professor Leopoldo Gutiérrez is a Metallurgical Civil Engineer graduated from the University of Concepción in 2001, after which he worked in a mining process engineering consulting company until December 2007. Later he settled in Vancouver (Canada) until June 2013, to carry out postgraduate studies (PhD and MASc) in mineral flotation, physicochemistry of particulate systems surfaces and rheology of mineral suspensions at the University of British Columbia. Since June 2013 he is an Academician in the Department of Metallurgical Engineering at the Universidad de Concepción where he is currently Associate Professor and Director of the Doctoral and Master's Programs in Metallurgical Engineering at the Department of Metallurgical Engineering, Faculty of Engineering, Universidad de Concepción. Professor Gutiérrez is also Principal Investigator of the Water Resources Center for Agriculture and Mining (CRHIAM) of the University of Concepción.
His experience in the mining industry includes contributions to scientific and applied research projects where he has developed technologies for use in the mining industry. In the academic field, he has developed lines of research on the effects of clay minerals on mineral flotation and suspension rheology, water in mineral processing, physicochemistry of particulate system surfaces, role of fine particles in concentrator plants, and energy efficiency.