

Virtual Technical Courses prior to Hydroprocess 2025

Free Access for All Registered Conference Participants

Wednesday, October 29

PRE-CONFERENCE ACTIVITIES

ONLINE

Virtual Technical Courses | Free Access for Congress Participants

SPA

10:00 –
12:20

Thermodynamic Aspects of Highly Concentrated Aqueous Solutions

Rodrigo Yepsen, Assistant Professor, Universidad de Concepción, Chile



Universidad de Concepción

ENG

14:00 –
17:15

Chloride Leaching, Chalcopyrite Passivation, and Enhancement of Oxidative

Wenying Liu, Associate Professor, and Edouard Asselin, Professor, University of British Columbia, Canada



THE
UNIVERSITY OF
BRITISH
COLUMBIA

Thursday, October 30

PRE-CONFERENCE ACTIVITIES

ONLINE

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SPA

10:00 –
13:15

**Advances in Metal Dissolution from Solids and Waste:
Leaching with Emerging Solvents**

Pía Hernández, Walter Blanco, Loreto Córdova, Sonia Cortés,
Montserrat Martínez and Mauricio Mura, Universidad de
Antofagasta, Chile



Monday, November 3

PRE-CONFERENCE ACTIVITIES

ONLINE

Virtual Technical Courses | Free Access for Congress Participants

15:00 –
18:00

Leaching Alternatives for Sulfide Ores

Mario Vera, Lilian Velásquez y Álvaro Videla, Associate
Professors, Pontificia Universidad Católica de Chile



COURSE 1:**Thermodynamic Aspects of Highly Concentrated Aqueous Solutions**

Rodrigo Yepsen

Assistant Professor, Universidad de Concepción, Chile

WHEN

Wednesday, October 29

LANGUAGE

Spanish

LENGTH

2 hours

DESCRIPTION

To apply thermodynamic concepts for the analysis of hydrometallurgical processes involving real solutions with high ion concentrations.

GENERAL OBJECTIVES

1. To study the chemical potential and activity coefficients for solutions with high ion concentrations.
2. To recognize aspects of high ion concentrations in solution on Eh-pH diagrams.

CONTENTS AND PROGRAM

10:00 - 10:50	Module 1 "Equilibria in Aqueous Phase"	Rodrigo Yepsen
10:50 - 11:00	Questions and Discussion Module 1	
11:00 - 11:10	Break 1	
11:10 - 12:00	Module 2 "Thermodynamics of Heterogeneous Systems"	Rodrigo Yepsen
12:00 - 12:10	Questions and Discussion Module 2	
12:10 - 12:20	Conclusions and Closure of the Course	Course Coordinator

LECTURER'S BIO

Rodrigo Yepsen is a Metallurgical Civil Engineer and holds a Ph.D. in Metallurgical Engineering from Universidad de Concepción, where he currently serves as an assistant professor in the area of Chemical Metallurgy. He has participated as a researcher in FONDEF and CRHIAM projects, as well as in collaborations with the mining industry, focusing on metal recovery from tailings and iron extraction from copper slags. His research centers on hydrometallurgy and surface physicochemistry, including sulfide leaching, process water remediation, and the study of seawater effects on mineral particle interactions during flotation and sedimentation processes.

COURSE 2:**Chloride Leaching, Chalcopyrite Passivation, and Enhancement of Oxidative**

Wenying Liu, Associate Professor

Edouard Asselin, Professor

University of British Columbia, Canada

WHEN

Wednesday, October 29

LANGUAGE

English (with Spanish interpretation)

LENGTH

3 hours

DESCRIPTION

The first module of this course will focus on fundamentals for chloride leaching and the use of chloride media for leaching of copper sulfide ores and flowsheet development; The second module will cover sulfur chemistry, chalcopyrite passivation, and ways for enhancing oxidative leaching.

GENERAL OBJECTIVES

1. Introduce chloride leaching, including fundamentals involved and various chloride-based leaching processes developed for treating secondary and primary copper sulfide ores.
2. Present sulfur chemistry, explain the mechanisms of chalcopyrite passivation, and discuss different approaches to enhance its leaching.

CONTENTS AND PROGRAM

14:00 - 15:15	Module 1 "Chloride Leaching and Its Industrial Applications"	Wenying Liu
15:15 - 15:30	Break 1	
15:30 - 16:45	Module 2 " Sulfur chemistry, chalcopyrite passivation, and ways for enhancing its leaching"	Edouard Asselin

16:45 – 17:00

Questions and Discussion

17:00 - 17:10

Conclusions and Closure of the Course

Course Coordinator

LECTURERS' BIO

Wenyang Liu is an Associate Professor and Canada Research Chair in Battery Materials Extraction in the Hydrometallurgy group at the University of British Columbia (UBC), Canada. She works closely with industry partners to develop aqueous-based processes for metal extraction from ore and mine waste. She also leads research in understanding contaminant release from mine waste materials. Dr. Liu obtained her PhD in Mineral Processing from the University of Queensland, Australia. She joined UBC in 2013 as a Postdoctoral Researcher in the Department of Mining Engineering and later became a faculty member in the Department of Materials Engineering.

Edouard Asselin is a Professor in the Department of Materials Engineering and he holds UBC's Industrial Research Chair in Hydrometallurgy. An applied electrochemist by training, he works with industry partners to develop hydrometallurgical processes for metal extraction and recovery. Dr. Asselin earned his PhD in Materials Engineering from UBC in 2007. He has been part of UBC's Hydrometallurgy Chair program since his appointment to UBC's faculty in 2007. He is a co-inventor of two commercial hydrometallurgical technologies.

COURSE 3:**Advances in Metal Dissolution from Solids and Waste:
Leaching with Emerging Solvents**

Pía Hernández, Walter Blanco, Loreto Córdova, Sonia Cortés, Monserrat Martínez and Mauricio Mura, Universidad de Antofagasta, Chile

WHEN

Thursday, October 30

LANGUAGE

Spanish

LENGTH

3 hours

DESCRIPTION

The course will address topics related to the dissolution of metals from copper sulfide minerals, mining residues (such as anode slimes, tailings, and slags), and electronic waste (such as solar panels), using emerging solvents like ionic liquids, deep eutectic solvents, amino acids, and alcohols. The focus will be on environmentally friendly approaches, particularly in the leaching process.

GENERAL OBJECTIVES

1. To examine current advances in metal dissolution from minerals and residues in order to optimize existing resources through the application of environmentally friendly leaching processes.
2. To analyze new trends in the development and application of green solvents such as ionic liquids, deep eutectic solvents, amino acids, and alcohols in metal dissolution.

CONTENTS AND PROGRAM

10:00 - 10:25	Challenges and Opportunities in the Leaching of Minerals/Residues with Emerging Solvents	Pía Hernández
10:25 - 10:30	Questions and Discussion	
10:30 - 10:55	Green Solvents Derived from Deep Eutectic Solvents (DES) for the Selective Leaching of Metals from Copper Anode Slimes	Walter Blanco
10:55 - 11:00	Questions and Discussion	

11:00 - 11:25	Application of Isopropanol as an Additive in the Acid-Oxidative Leaching of Chalcopyrite	Loreto Córdova
11:25 - 11:30	Questions and Discussion	
11:30 - 11:45	Break	
11:45 - 12:10	Leaching of Chalcopyrite Concentrates with Glycine: Toward Cleaner Copper Extraction	Sonia Cortés
12:10 - 12:15	Questions and Discussion	
12:15 - 12:40	Transforming Solar Waste into Value: Sustainable Recycling of Photovoltaic Panels Using Ionic Liquids	Montserrat Martínez
12:40 - 12:45	Questions and Discussion	
12:45 - 13:10	Study of Copper Extraction from Smelting Slags Using Glycine and Ferromanganese Crusts	Mauricio Mura
13:10 - 13:15	Conclusions and Closure of the Course	Course Coordinator

LECTURERS' BIO

Pía Hernández is a Chemical Industrial Civil Engineer with a Master's and Ph.D. in Mineral Process Engineering. She is a faculty member in the Department of Chemical and Mineral Process Engineering at Universidad de Antofagasta, Chile, and an associate researcher at the Advanced Mining Technology Center (AMTC). Her research has focused on chalcopyrite leaching in saline media (chlorides, nitrates, iodide/iodate), and she is currently exploring metal recovery from e-waste and tailings using emerging solvents. She is part of the research team at the Circular Economy Center for Industrial Processes (CECPI) at Universidad de Antofagasta.

Walter Blanco is a Metallurgical Engineer, graduated from Universidad Técnica de Oruro (Bolivia), where he also earned a Master's degree in Extractive Metallurgy and Environmental Control. He has taught at various higher education institutions, including Universidad Técnica de Oruro, the Technical Training Center CEDUC-UCN (affiliated with Universidad Católica del Norte), and Universidad Arturo Prat. He is currently in the final year of his Ph.D. in Mineral Process Engineering at Universidad de Antofagasta (Chile), conducting research focused on the recovery of valuable metals from copper anode slimes using deep eutectic solvents and the biosynthesis of silver nanoparticles. His research areas include the processing of metallic and non-metallic minerals, hydrometallurgical, pyrometallurgical, and solvometallurgical processes, and environmental control in the mining industry.

Loreto Córdova is a Chemical Civil Engineer with a diploma in Hydrometallurgy from the Escondida-BHP program. She has experience in black oxide leaching, production planning, and mineralogical estimation, gained at CODELCO and GeoAssay. During her doctoral studies in Plant Biotechnology, she participated in projects related to the forestry industry, and her research in agromining was recognized with the “Lanza Tu Innovación 2020” award. She is currently pursuing a Ph.D. in Mineral Process Engineering at Universidad de Antofagasta, focusing her thesis on chalcopyrite leaching using isopropanol as an additive. She is the founder of Ecoleach, a startup dedicated to the valorization of primary sulfides through clean leaching technologies, emphasizing chemical efficiency and responsible resource use.

Sonia Cortés is a Chemical Industrial Civil Engineer and holds a Master's in Engineering Sciences with a specialization in Mineral Processes from Universidad de Antofagasta. She is currently pursuing a Ph.D. in Mineral Process Engineering at the same institution, conducting research on environmentally friendly hydrometallurgical processes focused on metal recovery from complex matrices such as contaminated soils and tailings, using deep eutectic solvents, ionic liquids, and marine algae biomass. She has participated as a researcher in FONDECYT projects and is currently involved with the Advanced Mining Technology Center (AMTC). She has teaching experience in subjects related to renewable energy, circular economy, and mining process technologies.

Montserrat Martínez is a Chemical Industrial Civil Engineer from Universidad de Antofagasta, where she also earned a Master's in Engineering Sciences with a specialization in Mineral Process Engineering. She is currently pursuing a Ph.D. in Mineral Process Engineering at Universidad de Antofagasta. Her research focuses on the development and application of green solvents (ionic liquids and polymers) for separation processes in metallic, non-metallic, and urban mining. Her doctoral research centers on designing environmentally sustainable processes for the separation, recycling, and recovery of valuable elements in urban mining. She has participated in hydrometallurgy research projects, particularly in leaching and solvent extraction in valuable metal mining, promoting clean and sustainable technologies.

Mauricio Mura is a Metallurgical Civil Engineer from Universidad Católica del Norte, Chile, and holds a Master's in Engineering Sciences with a specialization in Mineral Process Engineering from Universidad de Antofagasta. He is currently pursuing a Ph.D. in Mineral Process Engineering at Universidad de Antofagasta. His research has focused on the application of green solvents such as ionic liquids and amino acids for separation processes in metallic (residues) and non-metallic mining. His current doctoral research is centered on magnesium removal from brine ponds using ionic liquids, aiming to promote cleaner and more sustainable reagents for the mining industry.

COURSE 4: **Leaching Alternatives for Sulfide Ores**

Mario Vera, Associate Professor

Lilian Velásquez, Associate Professor

Álvaro Videla, Associate Professor

Pontificia Universidad Católica de Chile

WHEN

Monday, November 3

LANGUAGE

Spanish

LENGTH

3 hours

DESCRIPTION

Due to the growing interest in copper extraction from sulfide minerals through hydrometallurgical processes, this course offers an overview of relevant approaches to address this challenge, including bioleaching, chloride leaching, and heap modeling. General concepts of bioleaching—a well-established technology for secondary sulfide minerals—will be reviewed, along with recent advances in chloride leaching, a method that has gained special attention in recent years for its potential to improve recovery from primary sulfide minerals such as chalcopyrite. Through applied case studies, key parameters controlling the efficiency of these processes will be discussed. Finally, heap leaching modeling will be introduced as a useful tool for those interested in exploring new methods of analysis, prediction, and optimization in hydrometallurgical process design. This course is aimed at professionals, students, and technicians seeking general and up-to-date knowledge in these topics, without requiring prior specialized expertise.

GENERAL OBJECTIVES

1. To understand the general principles of bioleaching and chloride leaching as alternatives for copper recovery from sulfide minerals.
2. To identify the main factors that control process efficiency, especially in the case of chalcopyrite, such as redox potential, temperature, presence of chlorides, bacteria, and leaching time.
3. To explore mathematical modeling of heap leaching as an introductory tool to support the evaluation and design of hydrometallurgical processes.

CONTENTS AND PROGRAM

15:00 - 15:40	Module 1: Bioleaching of Secondary Sulfide Minerals	Mario Vera
15:40 - 15:50	Questions and Discussion Module 1	
15:50 - 16:00	Break 1	
16:00 - 16:40	Module 2: Chloride Leaching of Copper Sulfide Minerals with a Focus on Chalcopyrite	Lilian Velásquez
16:40 - 16:50	Questions and Discussion Module 2	
16:50 - 17:00	Break 2	
17:00 - 17:40	Module 3: Shrinking Core Model, Transport and Energy Models in a Heap	Álvaro Videla
17:40 - 17:50	Questions and Discussion Module 3	
17:50 - 18:00	Conclusions and Closure of the Course	Course Coordinator

LECTURERS' BIO

Mario Vera holds a Ph.D. in Sciences with a specialization in Microbiology and a degree in Molecular Biotechnology Engineering from Universidad de Chile. He is an Associate Professor at the Institute of Biological and Medical Engineering and the Department of Mining Engineering at Pontificia Universidad Católica de Chile. He also serves as the Director of Research at the Institute of Biological and Medical Engineering UC. Dr. Vera specializes in Environmental Microbiology and the molecular biology of biofilms, with a particular interest in leaching microorganisms relevant to biomining technologies. His research focuses on the characterization of biopolymers from bioleaching microorganisms, their interaction mechanisms with metal sulfides, and their genetic transformation for future applications in synthetic biology. He is the Director of the Biomining Laboratory at DICTUC, where several applied projects and consulting services for the mining industry are currently underway, both nationally and internationally. Dr. Vera has mentored numerous graduate students in Chile and Germany (Universität Duisburg Essen) and has authored over 70 publications in international journals. Since 2017, he has represented Chile on the scientific committee of the International Biohydrometallurgy Symposium (IBS).

Lilian Velásquez holds a Ph.D. in Mineral Sciences from Murdoch University (Australia) and a degree in Metallurgical Civil Engineering from Universidad de Concepción (Chile). She is currently an Associate Professor in the Department of Mining Engineering at Pontificia Universidad Católica de Chile. She is a member of the National Pilot Testing Center (CNP) and the UC Energy Center. In 2015, she received the “Outstanding Research or Artistic Creation” award from Universidad Católica de Chile—the first time it was awarded within the Faculty of Engineering. In 2021, she was recognized among the “100 Inspirational Women in Mining” by WIM Chile. Her research focuses on sustainable hydrometallurgical processes, including chloride leaching of primary sulfide minerals such as chalcopyrite, reprocessing of mining residues (tailings, waste dumps, ripios), and urban mining (metal recovery from electronic waste). She has led research and innovation projects in collaboration with mining companies and maintains academic partnerships with national and international universities. She serves on editorial boards of international scientific journals and regularly participates as a reviewer and co-supervisor of undergraduate and graduate theses both in Chile and abroad.

Álvaro Videla holds a Ph.D. in Metallurgical Engineering from the University of Utah and a degree in Industrial Civil Engineering from Pontificia Católica de Chile. He is a Professor in the Department of Mining Engineering at the UC School of Engineering, Director of the UC Energy Center, and Co-founder and board member of the National Pilot Testing Center for Mining Technologies. He leads the applied research laboratory in mining at DICTUC and has served as an advisor and consultant for public and private companies for over 20 years. His main research areas include the development of sustainable processes for metal enrichment and purification, as well as process design and optimization. Dr. Videla has led national and international research projects, holds two granted patents, has published over 40 papers in international journals, and has supervised more than 20 graduate students. He is currently an affiliated researcher at the Lawrence Berkeley National Laboratory in California, USA.