

# Conference Program

## #ALTA2019



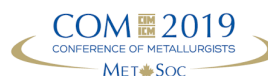
**Nickel-Cobalt-Copper,  
Uranium-REE, Gold-PM,  
In Situ Recovery, Lithium  
Conference & Exhibition**

18-25 May 2019

Pan Pacific Hotel, Perth, Australia

◆ 24<sup>th</sup> annual event ◆

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Government of Western Australia  
Department of Mines, Industry Regulation and Safety  
Geological Survey and Resource Strategy



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A special thank you to our sponsors, exhibitors, co-sponsors and partners.

## Sponsors



## Exhibitors



## Partners and Co-Sponsors



## Chairman's Welcome



A very warm welcome to our 24th annual conference to our returning regulars and those joining us for the first time. With more than 350 attendees from 32 countries, be sure to take advantage of this excellent opportunity for networking and gaining new contacts.

The program again reflects the upsurge in demand for metals for the battery and renewable energy industries such as nickel, cobalt, copper, lithium, and REEs, with an emphasis on process innovation. Uranium already plays a major role in providing “clean energy”, especially in Europe and Scandinavia, and we are pleased to have strong support from the IAEA for the 5th year. We are also grateful to Curtin University and CSIRO for partnering with us to present current technical developments in Gold-PM and ISR.

ALTA has been an annual platform for the PAL of laterites since the start of the 2nd generation projects in the 1990's. This year we include a Forum which acknowledges the 20th anniversary of the commissioning of the landmark Bulong, Cawse, and Murrin Murrin Nickel-Cobalt PAL projects.

A very special thanks to our Opening and Keynote Speakers, and to our many presenters for your time and effort. Thanks also to our Session and Panel Chairs who play such an important role during the conference.

We greatly value our sponsors and exhibitors, who make varied and valuable industry resources available to you. Please take the opportunity to meet with their representatives who will be pleased to discuss how they can assist you in your areas of interest. The lunches, session breaks and social events will be held in the exhibition, giving you the opportunity to visit all the booths.

We hope you enjoy the conference, and look forward to a great week together.

### Alan Taylor

Conference Founder and Chair  
Managing Director and Metallurgical Consultant  
ALTA Metallurgical Services

## Important Information

Please check the **Delegate Portal** regularly for program updates and announcements.

**Conference Papers** are available from the Delegate Portal during the conference. Visit the registration desk if you did not receive your password. The final e-proceedings and short course manuals will be sent to registered delegates in July.

Be sure to take advantage of our **unique open panel discussion** at the end of each conference.

Please note that photography, audio or video recording is **not permitted** during sessions.

**Daily Catering**, including arrival coffee, morning tea, lunch and afternoon tea, along with the Welcome Reception and Happy Hour will be held in the exhibition. If you have pre-registered special dietary requirements, please visit the separate catering station in the exhibition.

The **conference dinner** will be held in Grand River Ballroom on Tuesday evening. Please visit the desk if you would like to book one of the limited remaining tickets. If you have pre-registered special dietary requirements, please identify yourself to staff during the dinner.

**Complimentary Wi-Fi** is available in the conference centre courtesy of **LANXESS**. Instructions and access passwords are in your backpacks.

There is a **special offer** of 25% off all ALTA short course manuals and 2018 proceedings. Purchase online using discount code “ALTA2019-25” or via the order form in the program (offer expires 30 June).

**Our 25th anniversary event, ALTA 2020**, will be held here in Perth 23-31 May. Secure your place in the program early and take advantage of the 50% discount registration fee for Presenters. The Call for Papers is on the back page of the program.

## About the Conference

**ALTA 2019** is a world-class annual metallurgical conference, **now in its 24<sup>th</sup> year**, and a leading platform for innovation.

We are pleased to partner with **CSIRO Mineral Resources** for the In Situ Recovery sessions and **Curtin Gold Technology Group** for Gold-PM. The Uranium-REE and ISR sessions, and Heap Leaching short course are organised in co-operation with the **International Atomic Energy Agency (IAEA)**.

The emphasis of the program is practical rather than academic, and the themes running through the conference are the various aspects of technology and project development.

Held over eight days in Perth, it comprises five technical conferences, three short courses, and a trade exhibition. It features highly-focused programs, topical forums and key international speakers.

An outstanding platform for exposing the latest worldwide developments in plant operations, process technology, new projects, testwork and scale-up, process modelling and control systems, application of mineralogy and geometallurgy, R&D, equipment, reagents, materials, tailings disposal and environmental alleviation.

The program includes 100 papers from 23 countries [View abstracts](#)

PROGRAM OVERVIEW							
Saturday 18 May	Sunday 19 May	Monday 20 May	Tuesday 21 May	Wednesday 22 May	Thursday 23 May	Friday 24 May	Saturday 25 May
Short Course	Short Course	Conference Sessions					Short Course
Treatment of Nickel-Cobalt Laterites	Copper SX/EW Basic Principles & Detailed Plant Design	<b>Nickel-Cobalt-Copper</b>  Including <b>Pressure Acid Leaching</b> Forum & Panel  <i>Acknowledging the 20-year anniversary of the commissioning of the Bulong, Cawse and Murrin Murrin PAL projects.</i>		<b>Uranium-REE</b>  Including <b>Developments in IX</b> Forum & Panel  <i>in parallel with</i>  <b>Gold-PM</b>  Including <b>Fit-for-Purpose Leaching Systems</b> Forum & Panel	<b>In Situ Recovery</b>  Including <b>Enhancing ISR Permeability</b> Forum & Panel  <i>in parallel with</i>  <b>Lithium Processing</b>  Including <b>Novel Lithium Processes</b> Forum & Panel	Heap Leaching and its Application to Copper, Gold, Uranium & Nickel Ores	
		Welcome Reception	Conference Dinner		Happy Hour		
Exhibition							

## Keynote and Opening Speakers

Conference Opening Address	<b>David Weight</b> , President and Director, Cobalt Institute (UK) <i>The Changing Landscape of the Cobalt Market</i> <a href="#">View abstract</a>
Nickel-Cobalt-Copper Keynote	<b>Dr Bryn Harris</b> , Managing Partner, NMR360 Inc (Canada) <i>The Future of Ni-Co-Cu Processing in the Age of Lithium-Ion Batteries</i> <a href="#">View abstract</a>
Dinner Address	<b>Alan Taylor</b> , Metallurgical Consultant/Managing Director, ALTA (Australia) <i>The Rise of Cobalt – A Laterite Wars Story</i>
Uranium-REE Opening Address	<b>Dr Brett Moldovan</b> , Team Leader, Uranium Resources and Production, International Atomic Energy Agency (Austria) <i>What will Future Uranium Mining Projects Look Like?</i> <a href="#">View abstract</a>
Uranium-REE Keynote	<b>Dr Karin Soldenhoff</b> , Technology Manager, ANSTO Minerals (Australia) <i>Uranium IX - Past, Present and Future</i> <a href="#">View abstract</a>
Gold-PM Keynote	<b>Prof Jacques Eksteen</b> , Director, Gold Technology Group and Chair, Extractive Metallurgy, Western Australian School of Mines, Curtin University (Australia) <i>Fit-for-Purpose Precious Metals Leach Systems: Matching Leach Strategies to Source Characteristics</i> <a href="#">View abstract</a>
In Situ Recovery Keynote	<b>Dr Horst Maerten</b> , Vice President Technology, Heathgate Resources (Australia) and CEO, Umwelt- und Ingenieurtechnik GmbH Dresden (UIT) (Germany) <i>Trends in ISR Technology</i> <a href="#">View abstract</a>
Lithium Processing Keynote	<b>Adrian Griffin</b> , Managing Director, Lithium Australia (Australia) <i>Innovation Required to Meet Future Lithium Demand</i> <a href="#">View abstract</a>



# Program Overview

Saturday 18 May to Saturday 25 May



**Conference Venue: Pan Pacific Hotel, 207 Adelaide Terrace, Perth**

## Saturday 18 May

8:30am	Registration   Arrival Tea & Coffee	Foyer 5
9:00am	<b>Short Course: Treatment of Nickel-Cobalt Laterites</b>	Meeting Room 5

## Sunday 19 May

8:30am	Registration   Arrival Tea & Coffee	Foyer 5
9:00am	<b>Short Course: Copper SX/EW Basic Principles and Detailed Plant Design</b>	Meeting Room 5
2:00-5:00pm	Exhibitor Bump-In	Golden Ballroom
3:00-6:00pm	Registration	Foyer 1

## Monday 20 May

7:30am	Presenter Briefing	Goldsworthy
7:30am	Registration	Foyer 1
8:00am	Arrival Tea & Coffee	Golden Ballroom
9:00am	<b>Nickel-Cobalt-Copper Sessions</b>	Grand River Ballroom
5:30-7:30pm	<b>Welcome Reception</b>	Golden Ballroom

## Tuesday 21 May

7:30am	Presenter Briefing	Goldsworthy
8:30am	Arrival Tea & Coffee	Golden Ballroom
9:00am	<b>Nickel-Cobalt-Copper Sessions</b>	Grand River Ballroom
6:30-10:00pm	<b>Conference Dinner</b>	Grand River Ballroom West

## Wednesday 22 May

7:30am	Presenter Briefing	Boardroom
8:30am	Arrival Tea & Coffee	Golden Ballroom
9:00am	<b>Nickel-Cobalt-Copper Sessions</b>	Grand River Ballroom

## Thursday 23 May

7:30am	Presenter Briefing	Goldsworthy
7:30am	Registration	Foyer 1
8:00am	Arrival Tea & Coffee	Golden Ballroom
8:30am	<b>Uranium-REE Sessions</b>	In parallel with Gold-PM Grand River Ballroom East
8:30am	<b>Gold-PM Sessions</b>	In parallel with Uranium-REE Grand River Ballroom West
6:05-7:05pm	<b>Happy Hour</b>	Golden Ballroom

## Friday 24 May

7:30am	Presenter Briefing	Goldsworthy
8:00am	Arrival Tea & Coffee	Golden Ballroom
8:30am	<b>In Situ Recovery Sessions</b>	In parallel with Lithium Processing Grand River Ballroom East
8:30am	<b>Lithium Processing Sessions</b>	In parallel with In Situ Recovery Grand River Ballroom West

## Saturday 25 May

8:30am	Registration   Arrival Tea & Coffee	Foyer 5
9:00am	<b>Short Course: Heap Leaching &amp; its Application to Copper, Gold, Uranium &amp; Nickel Ores</b>	Meeting Room 5

## Treatment of Nickel-Cobalt Laterites

Meeting Room 5

8:30am **Registration | Arrival Tea & Coffee** (Foyer 5)

9:00am **Session 1**

10:30am **Morning Tea** (Foyer 5)

10:45am **Session 2**

12:15pm **Lunch** (Meeting Room 3)

1:15pm **Session 3**

2:45pm **Afternoon Tea** (Foyer 5)

3:00pm **Session 4**

4:30pm **Close**

## Course Presenter

**Alan Taylor**, Metallurgical Consultant/Managing Director, ALTA Metallurgical Services (Australia)

40+ years' experience in the metallurgical, mineral and chemical processing industries in Australasia, New Zealand, North and South America, Africa, Asia and Europe. He has worked in metallurgical consulting, project development, engineering/construction, plant operations, plant start-up and technology development. Projects and studies include copper, gold/silver, nickel/cobalt, uranium, base metals, phosphates and alumina. [Detailed CV](#)

## Course Outline

### Ore Characterization and Process Implications

- Idealized Orebody Profile
- Real Orebodies
- Metallurgical Implications

### Commercial Treatment Processes

- Pressure Acid Leaching
- Reduction Roast-Ammonia Leach (Caron) Process
- Smelting Processes
- Ferronickel and Matte Smelting
- Nickel Pig Iron Smelting

### Processes Under Development

- Heap Leaching
- Atmospheric Agitated Tank Leaching
  - Sulphuric Acid Leaching
  - Chloride Leaching
  - Nitric Acid Leaching
- Segregation Roasting

### Previously Proposed Processes

- Sulphation Roast
- Republic Steel Process
- Aqueous Chlorination Process

### Laterite Project Development

- Project Development Program
- Scoping Phase
- Prefeasibility Phase
- Final Feasibility Phase
- Pilot Plants
- Environmental Aspects

### Case Histories

- Moa Bay PAL
- Coral Bay (Rio Tuba) PAL
- Yabulu Reduction Roast-Ammonia Leach
- Cero Motoso Ferronickel Smelting
- PT Inco Matte Smelting

## Copper SX/EW Basic Principles and Detailed Plant Design

Meeting Room 5

8:30am **Registration | Arrival Tea & Coffee** (Foyer 5)

9:00am **Session 1**

10:30am **Morning Tea** (Foyer 5)

10:45am **Session 2**

12:15pm **Lunch** (Meeting Room 3)

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### Course Outline

- Basic Process
- Key SX functions
- Reasons for Growth
- Alternative Processes
- Organic Liquids in SX
- Typical Flowsheets
- SX Contractors
- SX Ancillary Facilities
- SX Fire Protection
- EW Cells
- EW Materials Handling
- EW Ancillary Facilities
- Plant Arrangement and Layout
- Materials of Construction
- Testwork
- Scale-Up and Design Criteria
- Plant Operation
- Performance and Risk
- Industry Trends

[Download detailed outline](#)

## Monday 20 May

7:30am **Presenter Briefing** (Goldsworthy)

7:30am **Registration** (Foyer 1)

8:00am **Arrival Tea & Coffee** (Golden Ballroom)

## Nickel-Cobalt-Copper Sessions (Grand River Ballroom)

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### Welcome and Opening Address

9:00am **Welcome**

**Alan Taylor**, Conference Founder & Chair, Managing Director & Metallurgical Consultant, ALTA Metallurgical Services (Australia)

### Sponsor Welcome

**Andrew Bekle**, Account Manager, Solvay (Australia)

9:20am **Opening: The Changing Landscape of the Cobalt Market**

**David Weight**, President, Cobalt Institute (UK)

### Keynote Address

9:50am **Keynote: The Future of Ni-Co-Cu Processing in the Age of Lithium-Ion Batteries**

**Dr Bryn Harris**, Managing Partner, NMR360 Inc (Canada)

10:30am **Morning Tea**

Session Chair: **Dr Mike Dry**, Owner, Arithmetek Inc. (Canada)

### Feature Project

11:00am **Feature: The Clean TeQ Sunrise Project - A One Stop Shop from Nickel Laterites to Lithium Ion Battery Feedstock - Project Update**

**Stephen Grocott**, Tim Harrison, David McFarlane, Clean TeQ Limited (Australia)

### Battery Metals

11:30am **The Future Battery Industries Cooperative Research Centre (FBICRC) and its Role to Catalyse Growth in Industries Across the Battery Value Chain**

**J.J. Eksteen**, Future Battery Industries Cooperative Research Centre (FBICRC)/WASM, Curtin University (Australia)

12:00pm **Design of Battery Grade Purity Nickel and Cobalt Sulphate Crystallisation Plants**

**Nipen M. Shah**, Stuart Bradbury, Dave M. Rogans, John J Warner, JordProxa Pty Ltd (Australia)

12:30pm **Lunch** Sponsored by **BASF**

Session Chair: **Dr Grant Wellwood**, General Manager, Jenike & Johanson Pty Ltd (Australia)

1:30pm **Process Modelling and Simulation in the Battery Era**

**James Groutsch**, MetEng Pty Ltd (Australia); Kevin Charlesworth, METSIM International LLC (Australia); Sargon Lovkis, Sargon Engineering (Australia)

2:00pm **Environmental Evaluation of Making Nickel Sulphate**

**Mike Dry**, Arithmetek Inc. (Canada); James Vaughan, University of Queensland (Australia); Will Hawker, Pure Battery Technologies (Australia)

2:30pm **Development of Selective Nickel Leaching Technology for Refining Mixed Nickel-Cobalt Hydroxide Precipitate**

**James Vaughan**, Stefan Lakemond, William Hawker, The University of Queensland (Australia); William Hawker, Stephen Wilmot, Richard Wittig, **Bjorn Zikarsky**, Pure Battery Technologies (Australia)

3:00pm **Afternoon Tea**

Session Chair: **Dr Bryn Harris**, Managing Partner, NMR360 (Canada)

### Laterite Processing

3:30pm **The Platina Scandium Project – One Step Closer to Production**

**Boyd Willis**, Boyd Willis Hydromet Consulting (Australia); Corey Nolan, Platina Resources Limited (Australia); John Horton, ResEval Pty Ltd (Australia)

4:00pm **Producing Ferronickel as a Process Alternative for Nickel Laterite Processing**

**Damian Connelly**, METS Engineering Group Pty Ltd (Australia)

### Project Risk

4:30pm **Is Your Class 1 Nickel Development Biased for Success or Failure?**

**Grant Wellwood**, Jenike & Johanson Pty Ltd (Australia)

5:00pm **Fire and Explosion Risks in Complex Hydrometallurgy Facilities**

**Larry J. Moore**, FM Global (USA)

5:30-7:30pm **Welcome Reception** (Golden Ballroom)

Proudly sponsored by **NobelClad** since 1999. Celebrating 20 years of supporting ALTA conferences.



### Tuesday 21 May

7:30am **Presenter Briefing** (Goldsworthy)

8:30am **Arrival Tea & Coffee** (Golden Ballroom)

### Nickel-Cobalt-Copper Sessions (Grand River Ballroom)

Sponsored by



*Session Chair: Dr Murdoch Mackenzie, Consultant, JWM Mackenzie (Australia)*

### Feature Project

9:00am **Feature: First Commercialisation of the Albion Process™ for Copper**

Paul Voigt, Glenn Stieper, **Mike Hourn**, Glencore Technology (Australia)

### Extraction & Purification

9:30am **Acorga™ CR60 Crud Mitigation Reagent - Commercial Trials in North America and Africa**

**Bravo Mbao**, Solvay EMEA (Zambia); Adam J. Fischmann, Laurent Cohen, Luis Moya, Michael Moser, Owen Tinkler, Solvay (USA)

10:00am **Further Development of the Continuous Ion Exchange Process for Copper Recovery from Fines**

**Pavel Spiridonov**, InnovEco (Australia); William Skinner, Jonas Addai-Mensah, University of South Australia (Australia); Hans Hein, Ricardo Hein, Oryxeo Ingeniería (Chile)

10:30am **Morning Tea**

*Session Chair: Tom Robinson, Senior Leader Business Development, Teck Resources Limited (Canada)*

11:00am **The Application of Solvent-Impregnated Resins for the Production of High-Purity Nickel and Cobalt Liquors**

**Johanna van Deventer**, William McDevitt, Purolite (South Africa)

11:30am **Membrane Technology Advances for Base Metal Processes**

**Ilya Krougly**, Johannes Herrmann, AMS Technologies (Israel); Les-Lee Thompson, Chimerical Technology (South Africa)

12:00pm **Uranium Removal by Ion Exchange Technology from Base Metal Streams – A DRC Case Study**

**Willem Vriesendorp**, Clean TeQ Water (China)

12:30pm **Lunch** Sponsored by **BASF**

*Session Chair: Bravo Mbao, Regional Technical Manager - EMEA & AP, Solvay (Zambia)*

### Filtration

1:30pm **Reagent and Product Recovery from Leached Ore Slurries Using Filter Presses**

**Andrew Hawkey**, Diemme Filtration (Aqseptence Group) (Australia); Francesco Kaswalder, Davide Cavalli, Diemme Filtration (Aqseptence Group) (Italy)

2:00pm **Tailings Management: An Overview and Technology Implementation within Acidic Process Environments**

**Edoardo Sommacal**, Matec Pacific (Australia); Martin Vieira, Matec S.r.l (Italy)

### Leaching Process Development

2:30pm **Future of the Glyleach™ Process Treating Komatiite Nickel Deposits in WA**

**Frank Trask**, Mining and Process Solutions (MPS) (Australia); Elsayed Oraby, Curtin University (Australia)

3:00pm **Afternoon Tea**

*Session Chair: Frank Trask, Technical Director, Mining & Process Solutions (Australia)*

3:30pm **Understanding the Arsenic In-Situ Precipitation During the AF 5-Catalyzed Atmospheric Sulfide Leaching Process**

Fazel Jahromi, **Ahmad Ghahreman**, Mining Department, Queen's University (Canada)

4:00pm **Hydrometallurgical Recovery of Cobalt and Copper from Cementation Residue at the Trail Zinc Refinery**

**Tom Robinson**, Tyler Seaman, Teck Resources (Canada)

4:30pm **The Impacts of Chloride upon the Leaching of Chalcopyrite**

**Robbie McDonald**, Denis Shiers, David Collinson, Tania Hidalgo, Laura Kuhar, CSIRO Mineral Resources (Australia)

6:30pm Drinks **Conference Dinner** (Grand River Ballroom West)

Sponsored by **JordProxa**

7:00pm Dinner

10:00pm

Close

**Address: The Rise of Cobalt – A Laterite Wars Story**

**Alan Taylor**, Conference Founder & Chair, Managing Director & Metallurgical Consultant, ALTA Metallurgical Services (Australia)

### Wednesday 22 May

7:30am **Presenter Briefing** (Goldsworthy)

8:30am **Arrival Tea & Coffee** (Golden Ballroom)

### Nickel-Cobalt-Copper Sessions (Grand River Ballroom)

Sponsored by



Session Chair: **Mike Miller**, Mike Miller Consultancy Services (Australia)

### Leaching Process Development (cont.)

9:00am **Investigation of the Resin in Moist Mix Process for the Nickel and Cobalt Recovery from Laterites**  
**Pavel Spiridonov**, InnovEco Australia (Australia); William Skinner, Jonas Addai-Mensah, University of South Australia (Australia); Hans Hein, Ricardo Hein, Oryxio Ingenieria (Chile)

### Heap Leaching

9:30am **Bioheapleaching in Boreal Conditions - Temperature Profile Inside the Heaps and Microbiology in Elevated Temperatures**  
**Ville Heikkinen, Mikael Korte**, Terrafame Ltd (Finland)

10:00am **Field Results from Leaching Aid Trials using BASF's LixTRA™ Reagent**  
**Jack Bender**, BASF (USA); Peter Haig, BASF (Australia)

10:30am **Morning Tea**

Session Chair: **Hermann Scriba**, Consultant, Linico Pty Ltd (Australia)

### Pressure Acid Leaching Forum

*Acknowledging the 20-year anniversary of the commissioning of the Bulong, Cawse and Murrin Murrin PAL projects.*

11:00am **20<sup>th</sup> Anniversary of the Anaconda, Bulong, Cawse Nickel-Cobalt HPAL Projects - Design and Commissioning Experiences - Lessons Learned**  
**Paul Tucker**, Bantrel Co (Canada)

11:30am **20 Years of Ti Clad in Hydrometallurgy**  
**Warren Salt**, NobelClad (USA)

12:00am **Review of Artificial Intelligence Use in High Pressure Acid Leach (HPAL)**  
**Cory Kosinski**, Alain Tshilombo, Vijay Reddy, Kelvin Buban, Sherritt Technologies (Canada); Chowdary Meenavilli, Siddhartha Tirumalaraju, Sriraj Meenavilli, NTWIST (Canada)

12:30pm **Lunch** Sponsored by **BASF**

Session Chair: **Alan Taylor**, Managing Director, ALTA Metallurgical Services (Australia)

1:30pm **The Clean TeQ Sunrise Project Flowsheet Rheology and Practical Implications on Process Design**  
**Fiona Sofra**, Rheological Consulting Services Pty Ltd (Australia); Tim Harrison, Clean TeQ Limited (Australia)

2:00pm **The Role of Dynamic Factors in Autoclave Scaling**  
**Mike Miller**, Mike Miller Consultancy (Australia)

2:30pm **The Clean TeQ Sunrise Project - Pilot Demonstrated Upgrade of Pressure Acid Leach Discharge Through Use of Continuous Resin In Pulp Technology**  
**Tim Harrison**, Jim Wall, Stephen Grocott, Clean TeQ Limited (Australia)

3:00pm **Afternoon Tea**

Session Chair: **Paul Tucker**, Engineering Manager, Bantrel Co. (Canada)

3:30pm **Synergistic Coprocessing of Nickel Laterite Ores and Sulphide Concentrates**  
**Hermann Scriba**, LiNiCo Pty Ltd (Australia)

4:00pm **Are we Heading into the 4<sup>th</sup> Generation of PAL Plants for Laterites?**  
**Alan Taylor**, ALTA Metallurgical Services (Australia)

4:30pm **Pressure Acid Leaching Panel Discussion and Q&A**  
*Acknowledging the 20-year anniversary of the commissioning of the Bulong, Cawse and Murrin Murrin PAL projects.*

Panel Chair: **Alan Taylor**, Managing Director, ALTA Metallurgical Services (Australia)

**Conference Close**

### About the Conference

**ALTA 2020** is a world-class annual metallurgical conference, **celebrating its 25th year**, and a leading platform for innovation. We are pleased to partner with **CSIRO Minerals** for the ISR sessions and **Curtin Gold Technology Group** for the Gold-PM sessions.

The emphasis of the program is practical rather than academic, and the themes running through the conference are the various aspects of technology and project development.

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An outstanding platform for exposing the latest worldwide developments in plant operations, process technology, new projects, testwork and scale-up, process modelling and control systems, application of mineralogy and geometallurgy, R&D, equipment, reagents, materials, tailings disposal and environmental alleviation.

PROGRAM OVERVIEW							
Saturday 23 May	Sunday 24 May	Monday 25 May	Tuesday 26 May	Wednesday 27 May	Thursday 28 May	Friday 29 May	Saturday 30 May
SHORT COURSE	SHORT COURSE	CONFERENCE SESSIONS					SHORT COURSE
A-Z of Copper Ore Leaching	SX and its Application to Copper, Uranium & Nickel-Cobalt	<b>Nickel-Cobalt-Copper</b>  Including <b>Hydromet Processing of Ni-Co-Cu Sulphides</b> Forum & Panel		<b>Uranium-REE</b>  Including <b>Application of Membranes</b> Forum & Panel  <i>in parallel with</i>  <b>Gold-PM</b>  Including <b>Fit-for-Purpose Leaching Systems</b> Forum & Panel		<b>In Situ Recovery</b>  Including <b>Enhancing ISR Permeability</b> Forum & Panel  <i>in parallel with</i>  <b>Lithium Processing</b>  Including <b>Innovations in Lithium Processing</b> Forum & Panel	Uranium Ore Processing
		Welcome Reception	Conference Dinner		Happy Hour		
EXHIBITION							

### Opportunities for Participation

#### Present

- 50% discount off registration fees (one per paper). 75% discount for sole consultant presenters.
- Participation in the Presenter Breakfast Briefing, unique to ALTA conferences.
- World-leading exposure through promotion of proceedings after the event, and later via the ALTA Free Library.

#### Sponsor

- Outstanding promotional opportunities including networking functions and conference merchandise.
- Includes one complimentary registration to the associated event/s and discount fees for additional staff.
- Promotion via conference website, materials and emails.

#### Exhibit

- Exhibition open to external visitors, with free entry during visitor hours.
- Includes one complimentary registration to the associated event/s and discount fees for additional staff.
- Promotion via conference website, materials and emails.

#### Attend

- Five international conferences with flexible registration options.
- Three pre and post conference technical short courses.
- Three networking functions.

Thank you to our Partners and Co-Sponsors

## Thursday 23 May

7:30am **Presenter Briefing** (Goldsworthy)  
 7:30am **Registration** (Foyer 1)  
 8:00am **Arrival Tea & Coffee** (Golden Ballroom)

## Uranium-REE Sessions (Grand River Ballroom East)

Organised in cooperation with



### Welcome and Opening Address

8:30am **Welcome**  
**Allison Taylor**, Conference & Exhibition Manager, ALTA Metallurgical Services (Australia)  
 8:35am **Opening Address: What will Future Uranium Mining Projects Look Like?**  
**Dr Brett Moldovan**, Team Leader, Uranium Resources and Production, International Atomic Energy Agency (IAEA) (Austria).  
 Co-author: Dr Martin Fairclough, Uranium Specialist, Uranium Resources and Production, IAEA (Austria)  
 Session Chair: **Grenvil Dunn**, Principal Process Engineer, Orway Mineral Consultants (WA) Pty Ltd

### Keynote Address

9:10am **Keynote Address: Uranium IX - Past, Present and Future**  
**Dr Karin Soldenhoff**, Technology Manager - Minerals, ANSTO (Australia)

### Heap Leaching

9:45am **The Development of a Geometallurgical Uranium Leaching Model as a Predictive Tool for Leach Optimisation**  
**John Lawson**, ANSTO Minerals/Consulting Metallurgist (Australia); Vanessa Liebezeit, BHP Planning & Technical Olympic Dam, (Australia)

10:10am **Morning Tea**  
 Session Chair: **Dr Brett Moldovan**, Team Leader, Uranium Resources and Production, IAEA (Austria)

10:40am **Central Jordan Uranium Project: Monitoring the Project Maturity via the Application of the UNFC-2009**  
**Hussein Allaboun**, Jordan Uranium Mining Company/Jordan University of Science and Technology (Jordan) (IAEA sponsored)

11:05am **The Research of Cladding Technology for Acidic Uranium Tailings and the Control of Radon Exhalation**  
**Kang Jianqiao**, Hu Penghua, Chen Gang, Li Xianjie, Wang Pan, Ren Jianjun, Beijing Research Institute of Chemical Engineering and Metallurgy (BRICEM), CNNC, (China) (IAEA supported)

### REE Projects

11:30am **The Development of the Dubbo Rare Metal and Rare Earth Flowsheet - Toongi NSW, Australia**  
**Nic Earner**, Ian Chalmers, Alkane Resources Ltd (Australia)

11:55am **The Nolans NdPr Project – Developing a Flowsheet Working With Ore Characteristics to Optimise Project Outcomes**  
**Alex Elliot**, **Stewart Watkins**, Arafura Resources Pty Ltd (Australia)

12:20pm **Lunch** Sponsored by **Purolite**  
 Session Chair: **Dr Karin Soldenhoff**, Technology Manager - Minerals, ANSTO (Australia)

### By-Product Uranium

1:20pm **U and REE Recovery from Phosphates in the Philippines**  
**Jennyvi Ramirez**, Botvinnik Palattao, Estrellita Tabora, Editha Marcelo, Socorro Intoy, Edmundo Vargas, Rolando Reyes, Philippine Nuclear Research Institute (Philippines) (IAEA sponsored)

1:45pm **Uranium Recovery from Copper Concentrate**  
**Grenvil Dunn**, Yong Yong Teo, Orway Mineral Consultants Pty Ltd (WA) (Australia)

### Process Development

2:10pm **Predicting the Speciation and Properties of Rare Earth Elements During Chemical Extraction from Mineral Deposits**  
**Rasika Nimkar**, **Anthony Gerbino**, OLI Systems, Inc. (USA)

2:35pm **Rare Earth Recovery and Separation Using Diglycolamides**  
**Eugen Andreiadis**, Manuel Miguiditchian, Vincent Pacary, French Alternative Energies and Atomic Energy Commission (CEA), Nuclear Energy Division, Research Department on Mining and Fuel Recycling Processes (France)

3:00pm **Afternoon Tea**  
 Session Chair: **Alan Taylor**, Managing Director, ALTA Metallurgical Services (Australia)

3:30pm **Hydrometallurgy Process on Radioactive and Rare Earth Elements Extraction from Monazite in Indonesia**  
**Riesna Prassanti**, Kurnia Trinopiawan, Mutia Anggraini, Kurnia Setiawan Widana, Yariantio Sugeng Budi Susilo, Center for Nuclear Minerals Technology - National Nuclear Energy Agency (BATAN) (Indonesia) (IAEA supported)



### Thursday 23 May (continued)

#### Process Development (continued)

3:55pm **Fluid Bed Precipitation (with particular reference to Uranium Oxide Concentrates)**

Glen Jobling, Adelaide Control Engineering (Australia)

4:20pm **Decomposition of Xenotime Concentrate Using Alkaline Fusion Method**

Khaironie Mohamed Takip, **Jacqueline Kones**, Roshasnorlyza Hazan, Norhazirah Azhar, Wilfred Paulus, Nur Aqilah Sapiee, Materials Technology Group, Industrial Technology Division, Malaysian Nuclear Agency (ANM) (Malaysia) (IAEA supported)

#### Developments in IX Forum

4:45pm **Development of AXIONIT Selective Ion Exchange Resins for Recovery of Rare-Earth Elements and Actinides**

D.A. Kondrutskiy, E.S. Vostrov, G.R. Gadzhiev, V.A. Tretiakov, V.V. Milyutin, N.A. Nekrasova, AXION – Rare-earth and Noble Metals, JSC (Russia)

5:10pm **Positioning of IX within the Uranium Industry**

Seshree Pillay, Mintek (South Africa)

5:35pm **Developments in IX Panel Discussion and Q&A**

Panel Chair: **Alan Taylor**, Managing Director, ALTA Metallurgical Services (Australia)

6:05-7:05pm **Happy Hour** (Golden Ballroom)

Sponsored by **Ausenco**

#### Included in proceedings but not presented

**Production of UO<sub>2</sub> Powder Through Yellow Cake Conversion Process Using Pilot Conversion Plant Facilities in Center for Nuclear Fuel Technology - BATAN**

**Agus Sartono DS**, Ade Saputra, S.ST, Center for Nuclear Fuel Technology, National Nuclear Energy Agency (BATAN) (Indonesia) (IAEA supported)

**Alluvial Tin Mining and Processing at Heinda Mine : A Challenge for Enhancing Recovery Along with Co-Product of U-Th-REE in Monazite**

Pipat Laowattanabandit, Department of Mining and Petroleum Engineering, Chulalongkorn University (Thailand) (IAEA supported)

**A Selective Removal of Thorium by Ion Imprinted Poly(Bis[2-Methacryloyloxy]Ethyl]Phosphate)-Grafted Non-Woven Fabrics**

**Sarala Selambakkannu**, Nor Azillah Fatimah Othman, Radiation Processing Technology, Malaysian Nuclear Agency (Malaysia); Wilfred Sylvester Paulus, Nur Aqilah Sapiee, Industrial Technology Division, Malaysian Nuclear Agency (Malaysia); Rahman Yaccup, Environmental Tracer Application Group (e-TAG), Waste and Environmental Technology Division, Malaysian Nuclear Agency (Malaysia) (IAEA supported)

**Uranium Mine Development in Mongolia**

**Dorjyunden Altankhuyag**, Ministry of Mining and Heavy Industry (MMHI) (Mongolia); Baldorj Baatarsogt, The Nuclear Energy Commission (NEA) (Mongolia) (IAEA supported)

## Thursday 23 May

7:30am **Presenter Briefing** (Goldsworthy)

7:30am **Registration** (Foyer 1)

8:00am **Arrival Tea & Coffee** (Golden Ballroom)

### Gold-PM Sessions (Grand River Ballroom West)

Sponsored by



#### Welcome and Opening Address

8:30am **Welcome**

**Alan Taylor**, Conference Founder & Chair, Managing Director & Metallurgical Consultant, ALTA Metallurgical Services (Australia)

#### Sponsor Welcome

**Arnaud Voisin**, Markets Manager - IM, Air Liquide Australia Limited (Australia)

*Session Chair: Dr Paul Breuer, Principal Research Scientist - Gold Processing, CSIRO (Australia)*

#### Keynote Address

8:45am **Keynote Address: Fit-for-Purpose Precious Metals Leach Systems: Matching Leach Strategies to Source Characteristics**

**Prof Jacques Eksteen**, Director, Gold Technology Group and Chair, Extractive Metallurgy, Western Australian School of Mines, Curtin University (Australia)

#### Application of IX

9:20am **Go for Gold and Ignore Cyanide Soluble Copper - A New Approach to Gold/Copper Ores**

**Malcolm Roy Paterson**, PT Green Gold Engineering (Indonesia)

9:45am **Gold Recovery via Ion Exchange Resins and Activated Carbon – A Comparison of Test Work Methods**

**Ben Strong**, Stephen La Brooy, Ausenco (Australia)

10:10am **Morning Tea**

*Session Chair: Seshree Pillay, Head : Precious Metals and Uranium, Mintek (South Africa)*

10:40am **Gold Recovery from Carbon Fines**

Volha Bazhko, Mintek (South Africa); Presenter: **Bongiwe Nkabane**, Mintek (South Africa)

#### Process Optimisation

11:05am **Evaluation of Oxygen Requirements of a Refractory Concentrate in a Comprehensive Pre-Oxidation and Cyanide Leaching System**

**Sumedh Gostu**, Pablo Cisternas, Tim Murray, Air Liquide Delaware Innovation Campus (USA)

11:30am **Development and Implementation of the EKATO Combijet<sup>®</sup> Impeller in a Bioleach Application at the Polyus Olimpiada Mine**

**Wolfgang Keller**, Annette Rümmele, EKATO RMT (Germany); Aleksandr Beliy, JSC Polyus Research Center (Russia); Dmitry Chernov, Polyus LLC (Russia)

11:55am **Demonstration at Scale in the Field of a Non-Toxic Reagent System to Recover Gold**

**Paul Breuer**, Michael Jackson, Marlene Engelbrecht, Amy Evans, Lauren Bourke, CSIRO (Australia); Jeff McCulloch, Eco Minerals Research Limited (Australia) / Clean Mining Limited (Australia)

12:20pm **Lunch** Sponsored by **Purolite**

*Session Chair: Dr Yeonuk Choi, President, YaKum Consulting Inc. (Canada)*

1:20pm **Carbon Circuit Health Check**

Aaron Clafin, **Ben Strong**, Jeff Clafin, Stephen La Brooy, Ausenco (Australia)

1:45pm **Real-Time Monitoring of Precious Gold in Slurries**

**Y. Van Haarlem**, B. Ganly, J. O'Dwyer, D. Abernethy, CSIRO (Australia)

#### Fit-for Purpose Leaching Systems Forum

2:10pm **Geometallurgy and Process Mineralogy of Gold Ores: Methodologies and Applications in Process Selection and Plant Optimization**

**Joe Zhou**, Jing Li, Joe Zhou Mineralogy Ltd (Canada)

2:35pm **Cyanide Free Future of Gold Processing - Process Simulation and Knowledge Modelling**

**Heini Elomaa**, Maria Leikola, Mari Lundström, Aalto University (Finland); Lotta Rintala, VTT (Finland)

3:00pm **Afternoon Tea**

*Session Chair: Rick Edwards, Sales Engineer, Air Liquide (Australia)*

3:30pm **Technology Options for Processing a Gold Ore with Variable Refractory Characteristics**

**Damian Connelly**, METS Engineering Group Pty Ltd (Australia)

3:55pm **Development of Mixed Chloride Process for Gold Recovery**

**Yeonuk Choi**, YaKum Consulting Inc. (Canada); V.I. Lakshmanan, R. Sridhar, D. Tait, R. deLaat, M.A. Halim, J. Chen, Process Research ORTECH Inc. (Canada)

### Thursday 23 May (continued)

#### *Fit-for Purpose Leaching Systems Forum (continued)*

- 4:20pm **Evaluation of Various Options to Minimise the Impact of Copper on Gold Electrowining in an Acacia Gravity Gold Processing Plant**  
**Xianwen Dai**, Gay Walton, Karl Bunney, Paul Breuer, CSIRO (Australia); Amos Biteya, Mahmood Yass, Katavi Mining Company Ltd. (Tanzania)
- 4:45pm **Development of a Glycine-Cyanide Leach Process for Gold-Copper Concentrate**  
**Brigitte Seaman**, Newcrest Mining Limited (Australia); Tim Newton, Mining and Process Solutions (Australia); Elsayed Oraby, Curtin University (Australia)
- 5:10pm **Options of Gold and Copper Recovery from Glycine and Glycine-Cyanide Solutions**  
**Elsayed Oraby**, Peo Tauetsile, Zixian Deng, Jacques Eksteen, Western Australian School of Mines, Curtin University (Australia)
- 5:35pm **Fit-for-Purpose Leaching Systems Panel Discussion and Q&A**
- Panel Chair: **Prof Jacques Eksteen**, Director, Gold Technology Group and Chair, Extractive Metallurgy, Western Australian School of Mines, Curtin University (Australia)*
- 6:05-7:05pm **Happy Hour** (Golden Ballroom)  
 Sponsored by **Ausenco**

## Friday 24 May

7:30am **Presenter Briefing** (Goldsworthy)

7:30am **Registration** (Foyer 1)

8:00am **Arrival Tea & Coffee** (Golden Ballroom)

## In Situ Recovery Sessions (Grand River Ballroom East)

Sponsored by



### Welcome and Opening Address

8:30am **Welcome**

**Allison Taylor**, Conference & Exhibition Manager, ALTA Metallurgical Services (Australia)

### Sponsor Welcome

**Ewan Sellers**, Program Director, Mining3 (Australia)

*Session Chair: John O'Callaghan, Head of Metallurgy, Newcrest Mining (Australia)*

### Keynote Address

8:40am **Keynote Address: Trends in ISR Technology**

**Dr Horst Maerten**, Vice President Technology, Heathgate Resources (Australia) and CEO, Umwelt-und Ingenieurtechnik GmbH Dresden (UIT) (Germany)

### Developments in Uranium ISR

9:15am **Automated Ground Water Monitoring for an Australian In-Situ Recovery Mining Operation**

**Kathie McGregor**, Daniella Caruso, Mikko Vepsalainen, Miao Chen, Dylan Marley, David Macedo, Tom Austin, Tony Kilpatrick, Avi Bendavid, CSIRO (Australia); Kathryn Levingstone, Andrea Marsland-Smith, Rohan Calley, Gavin Agius, Heathgate Resources Pty Ltd (Australia)

9:40am **2D Reactive Transport Simulation of Well Clogging During Acidic Uranium In Situ Leaching Process**

**Maëlle Vergnaud**, Vincent Lagneau, MINES ParisTech, PSL Research University, Centre de Géosciences (France); Anthony Le Beux, Orano Mining (France)

### Use of Bacteria

10:05am **Microbially-Assisted In Situ Metal Recovery - Where Does it Make Sense?**

**Frank Roberto**, Newmont Goldcorp Inc. (USA)

10:30am **Morning Tea**

*Session Chair: Dr Ewan Sellers, Program Director, Mining3 (Australia)*

10:55am **The Use of Bugs for In Situ Leaching Offers a New Frontier for Monetising Stranded Assets**

Ian R F MacCulloch, Coomooroo Explorations Coy Pty Ltd (Australia); Leslie C Thompson, Auric BioRecovery (USA)  
Presenter: **James K Dirstein**, Geophysicist and Company Director (Australia)

### ISR for Non-Uranium Metals

11:20am **In Situ Recovery for Non-Uranium Metals**

**Maxim Serezhkin**, CSA Global Pty Ltd (Australia); Makhail Savenya, UGTC Ltd (Russia)

11:45am **The Potential of Insitu Recovery for Copper, Gold and Other Metals, The Kapunda Project as a Possible Example**

**Leon Faulkner**, Environmental Copper Recovery Pty Ltd (Australia)

12:10pm **Staged Leaching of Bornite with Acidic Solutions at Moderate Temperature in an In-Situ Recovery Environment**

**Tania Hidalgo**, Curtin University/CSIRO (Australia); Robbie McDonald, Laura Kuhar, CSIRO (Australia); Andreas Beinlich, Andrew Putnis, Curtin University (Australia)

12:35pm **Lunch** Sponsored by **Purolite**

*Session Chair: Leon Faulkner, Managing Director, Environmental Copper Recovery Pty Ltd (Australia)*

1:35pm **Lixiviant Screening for Application to Copper and Gold Containing Ores in In-Situ Recovery Applications**

**Laura Kuhar**, Amy Evans, Rebecca Meakin, Gay Walton, Robbie McDonald, Jian Li, CSIRO/Mining3 (Australia)

2:00pm **The Leaching of Gold by Alkaline Glycine in Microchannels**

**Mohammad Reza Azadi**, Ali Karrech, Mostafa Attar, Mohamed Elchalakani, Department of Civil, Mining and Environmental Engineering, University of Western Australia (Australia)

### Enhancing ISR Permeability Forum

2:25pm **Innovations in Rock Fragmentation and Fracturing - Creating Access for Leaching**

**Ewan Sellers**, S Dehkhoda, Ebrahim Fathi Salmi, R Puscasu, Mining3 (Australia)

2:50pm **Potential Use of Blasting to Enhance Permeability**

**Peter Dare-Bryan**, Stephen Boyce, Orica (Australia)

3:15pm **Afternoon Tea**



**Friday 24 May** (continued)

**Enhancing ISR Permeability Forum (continued)**

*Session Chair: Dr Horst Maerten, Vice President Technology, Heathgate Resources (Australia) and CEO, UIT (Germany)*

3:35pm **An Artificial Fracture Stimulation Technique for Enhanced In Situ Recovery Using Non-Explosive Demolition Agents**

**De Silva V.R.S.**, Ranjith P.G., 3GDeep Research Laboratory, Department of Civil Engineering, Monash University (Australia)

4:00pm **In Situ Recovery Enhancement in Hard Massive Rocks by Hydraulic Fracturing**

**Runhua Feng**, Lingping Zeng, Shoaib Memon, Mostafa Sharifzadeh, Mohammad Sarmadivaleh, School of WASM: Minerals, Energy and Chemical Engineering, Curtin University (Australia)

4:25pm **Hydraulic Fracturing in In Situ Recovery – Methods and Equipment for Field Trials**

**Kevin Quinlan**, James Kear, CSIRO Energy (Australia); Rob Jeffrey, SCT Operations Pty Ltd (Australia)

4:50pm **Enhancing ISR Permeability Panel Discussion and Q&A**

*Panel Chair: Dr Laura Kuhar, Research Team Leader, CSIRO (Australia)*

5:20pm **Conference Close**

Friday 24 May

## Friday 24 May

7:30am **Presenter Briefing** (Goldsworthy)

7:30am **Registration** (Foyer 1)

8:00am **Arrival Tea & Coffee** (Golden Ballroom)

## Lithium Processing Sessions (Grand River Ballroom West)

Sponsored by



### Welcome and Opening Address

8:30am **Welcome**

**Alan Taylor**, Conference Founder & Chair, Managing Director & Metallurgical Consultant, ALTA Metallurgical Services (Australia)

### Sponsor Welcome

**Dr Anthony Gerbino**, Scientist, OLI Systems (USA)

*Session Chair: Dr Goutam Das, Research Project Leader/Senior Research Scientist, CSIRO Mineral Resources (Australia)*

### Keynote Address

8:40am **Keynote Address: Innovation Required to Meet Future Lithium Demand**

**Adrian Griffin**, Managing Director, Lithium Australia (Australia)

### Production and Recycling

9:15am **Recent Advances in Hydrometallurgy for the Development of a Sustainable Production of Lithium-Ion Batteries**

**Alexandre Chagnes**, Université de Lorraine, CNRS, GeoRessources (France)

### Roasting and Calcination

9:40am **The Nature of Lithium Mineral Physical Properties in Selecting Calcination and Roasting Equipment**

**Grant Harman**, Lithium Consultants Australasia (Australia)

10:05am **Tunnel Kiln Mineral Roasting**

**Jeffrey K Claflin**, Scott Brindley, Aaron Claflin, Ausenco Minerals (Australia)

10:30am **Morning Tea**

*Session Chair: Dr Jeffrey Claflin, Consulting Process Engineering, Ausenco (Australia)*

### Project Development

10:55am **Project Derisking: The Importance of Metallurgical Testing and Piloting within the Project Lifecycle in the Processing of Lithium Materials**

**Pete Forakis**, Dwight van der Meulen, SGS Minerals Metallurgy (Australia)

11:20am **Brine Chemistry and Properties Prediction During Salar Evaporation to Maximize Product Yield**

**Diana Miller**, **Anthony Gerbino**, OLI Systems, Inc. (USA)

11:45am **Cost-Effective Use of Duplex Stainless Steel for Structural Applications in Metallurgical Processes for the Production of Lithium and Battery Metal Materials**

**Claes Tigerstrand**, Outokumpu (Sweden); **Duncan McLennan**, Con Logos, Outokumpu (Australia)

### Safety

12:10pm **Lithium Mining Operations: The Safety Regulator's Perspective**

**Martin Ralph**, Department of Mines, Industry Regulation and Safety (DMIRS) (Australia)

12:35pm **Lunch** Sponsored by **Purolite**

*Session Chair: Dr Anthony Gerbino, Scientist, OLI Systems (USA)*

### Purification and Recovery

1:35pm **The Use of Selective Resins with Small Particle Size in Lithium Brine Purification**

**Dirk Steinhilber**, Stefan Neufeind, LANXESS Deutschland GmbH, Liquid Purification Technologies (Germany); **Lydia Tang**, **R. Bhavaraju**, LANXESS Pty Ltd (Australia)

2:00pm **Selective Recovery of Lithium Using Membrane Technology**

**Ilya Krougly**, **Johannes Herrmann**, AMS Technologies (Israel); **Les-Lee Thompson**, Chimerical Technology (South Africa)

### Novel Lithium Processes Forum

2:25pm **Sustainable Plant Design - Case Study for Lithium Production from Spodumene**

**Dylan van den Berg**, **Lachlan Wright**, **Greg Sheehan**, Hatch (Australia)

2:50pm **Technical Options for Processing a Lithium Clay Ore and Achieving High Purity Lithium Carbonate**

**Damian Connelly**, METS Engineering Group Pty Ltd (METS) (Australia)

3:15pm **Afternoon Tea**

*Session Chair: Grant Harman, Lithium Consultants Australasia, (Australia)*

3:35pm **Lithium from Clay Versus Lithium from Spodumene – Round 1**

**Mike Dry**, Arithmetek Inc. (Canada); **Rene LeBlanc**, Lithium Americas Corp. (Canada)

**Friday 24 May** (continued)

*Novel Lithium Processes Forum (continued)*

4:00pm	<b>A Review of Lithium Hydroxide Production Methods</b> <b>Chris Griffith</b> , Adam Roper, ANSTO, Minerals Business Unit (Australia)
4:25pm	<b>Extraction of Lithium from Spodumene Concentrate</b> <b>Goutam Kumar Das</b> , Robbie McDonald, Karl Bunney, CSIRO Mineral Resources (Australia); Yatendra Sharma, Consultant to Neometals Pty Ltd (Australia)
4:50pm	<b>Outotec Lithium Hydroxide Process - A Novel Direct Leach Process for the Production of Battery Grade Lithium Hydroxide Monohydrate from Calcined Spodumene</b> <b>Marika Tiihonen</b> , Liisa Haavanlammi, Sami Kinnunen, Eero Kolehmainen, Outotec (Finland) Oy (Finland)
5:15pm	<b>Novel Lithium Processes Panel Discussion and Q&amp;A</b>  <i>Panel Chair: <b>Dr Chris Griffith</b>, Senior Process Chemist / Business Development Lead, ANSTO Minerals (Australia)</i>
5:45pm	<b>Conference Close</b>

## Heap Leaching & its Application to Copper, Gold, Uranium & Nickel Ores

Meeting Room 5

8:30am **Registration | Arrival Tea & Coffee** (Foyer 5)

9:00am **Session 1**

10:30am **Morning Tea** (Foyer 5)

10:45am **Session 2**

12:15pm **Lunch** (Meeting Room 3)

1:15pm **Session 3**

2:45pm **Afternoon Tea** (Foyer 5)

3:00pm **Session 4**

4:30pm **Close**

### Course Presenter

**Alan Taylor**, Metallurgical Consultant/Managing Director, ALTA Metallurgical Services (Australia)

40+ years' experience in the metallurgical, mineral and chemical processing industries in Australasia, New Zealand, North and South America, Africa, Asia and Europe. He has worked in metallurgical consulting, project development, engineering/construction, plant operations, plant start-up and technology development. Projects and studies include copper, gold/silver, nickel/cobalt, uranium, base metals, phosphates and alumina. [Detailed CV](#)

### Course Outline

#### Heap Leaching Technology General

- Basics
- Alternative Process Flowsheets
- Layout
- Pad Design
- Liner Selection
- Ore Transport and Heap Building Methods
- Solution Management
- Operation and Control
- Cold and Wet Climate Operation
- Remining of Partially Leached Heaps

#### Applications of Heap Leaching

- Application to Copper Ores
  - Role of Bacteria in Treatment of Sulphide Ores
  - Alternative Ferrous Re-Oxidizing Methods
  - Typical Copper Heap Leach Design Criteria
- Application to Gold Ores
- Application to Uranium Ores
- Application to Nickel Ores

#### Testwork and Scale-Up

#### Industry Trends





# Short Courses

**ALTA Metallurgical Services**  
*Celebrating 33 Years of Service*

ALTA presents seven **practically-oriented technical short courses** as a valuable introduction for newcomers and a useful refresher for old hands. Courses are kept current with annual updates.

## Short Courses

A-Z of Copper Ore Leaching

Copper SX/EW Basic Principles and Detailed Plant Design

Copper Oxide Ore Heap Leaching Testwork and Scale-Up

Heap Leaching and its Application to Copper, Gold, Uranium and Nickel Ores

Solvent Extraction and its Application to Copper, Uranium & Nickel-Cobalt

Treatment of Nickel-Cobalt Laterites

Uranium Ore Processing

## Participation Options

Scheduled courses (below)

Presentation at your office or via Skype

Purchase short course manuals and immediately download from [Publications](#) (discounts for 2 or more)

## Scheduled Courses

18 May 2019	Treatment of Nickel-Cobalt Laterites	<a href="#">ALTA 2019</a> Perth, Australia
19 May 2019	Copper SX/EW Basic Principles and Detailed Plant Design	<a href="#">ALTA 2019</a> Perth, Australia
25 May 2019	Heap Leaching & its Application to Copper, Gold, Uranium & Nickel Ores	<a href="#">ALTA 2019</a> Perth, Australia
23 May 2020	A-Z of Copper Ore Leaching	<a href="#">ALTA 2020</a> Perth, Australia
24 May 2020	SX and and Application to Copper, Uranium and Nickel-Cobalt	<a href="#">ALTA 2020</a> Perth, Australia
30 May 2020	Uranium Ore Processing	<a href="#">ALTA 2020</a> Perth, Australia

## Course Presenter

The courses are presented by **Alan Taylor**, Metallurgical Consultant and Managing Director, ALTA Metallurgical Services. Alan draws from his extensive first-hand experience with major engineering firms and as an independent consultant. He has worked on a wide variety of projects from the late 1960s through to the present time – a period which has seen the introduction of many new technical developments.

Alan has 40+ years' experience in the metallurgical, mineral and chemical processing industries in Australasia, New Zealand, North and South America, Africa, Asia and Europe. He has worked in metallurgical consulting, project development, engineering/construction, plant operations, plant start-up and technology development. Projects and studies have involved copper, gold/silver, nickel/cobalt, uranium and base metals.

Since 1985, as an independent metallurgical consultant, Alan has as undertaken feasibility studies, project assessment, project development, supervision of testwork, flowsheet development, basic engineering, supervision of detailed engineering, plant commissioning and peer reviews and audits. Clients have included a variety of major and junior mining, exploration and engineering companies throughout Australia and overseas.

## Conference Special - 25% discount for orders placed prior to June 30

Scan this form at the ALTA booth or order online using the discount code "ALTA2019-25"

		Price AUD	SALE Price	Total AUD
Short Course Manuals	A-Z of Copper Ore Leaching	\$300	\$225	
	Copper Oxide Ore Heap Leaching Testwork and Scale-Up	\$300	\$225	
	Copper SX/EW Basic Principles and Detailed Plant Design	\$300	\$225	
	Heap Leaching and its Application to Copper, Uranium and Nickel Ores	\$300	\$225	
	SX and its Application to Copper, Uranium and Nickel-Cobalt	\$300	\$225	
	Treatment of Nickel-Cobalt Laterites	\$300	\$225	
	Uranium Ore Treatment	\$300	\$225	
Conference Proceedings	2019 Nickel-Cobalt-Copper <b>*July Delivery*</b>	\$195	\$146	
	2018 Nickel-Cobalt-Copper	\$95	\$71	
	2019 Uranium-REE <b>*July Delivery*</b>	\$75	\$56	
	2018 Uranium-REE-Lithium	\$65	\$49	
	2019 Gold-PM <b>* July Delivery*</b>	\$75	\$56	
	2018 Gold-PM	\$65	\$49	
	2019 In Situ Recovery <b>*July Delivery*</b>	\$75	\$56	
	2018 In Situ Recovery Symposium	\$40	\$30	
	2019 Lithium Processing <b>*July Delivery*</b>	\$75	\$56	
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### CONTACT

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ALTA Metallurgical Services (ALTA) was established by Metallurgical Consultant Alan Taylor in 1985 to serve the worldwide mining, minerals and metallurgical industries. ALTA offers a wide range of services and resources to the metallurgical industry.

### Consulting

High-level metallurgical and project development consulting.

### Short Courses

Practically-oriented short courses presented by Alan Taylor. Topics include treatment of nickel laterites, copper ore leaching, uranium ore processing, copper SX-EW, heap leaching and solvent extraction.

### Conferences

The annual ALTA conference is a world premier metallurgical event and a leading platform for innovation. [ALTA 2019](#) is the 24<sup>th</sup> annual conference and will be held 18-25 May in Perth, Australia. The event comprises five international technical conferences, three short courses and an international trade exhibition. It features a highly-focused program, topical forums and presentations from key international speakers.

### Publications

Proceedings and manuals from ALTA conferences, seminars and short courses.

### MetBytes

Free technical articles offering metallurgical commentary and insights.

### Free Library

Includes proceedings from 1995-2017 Nickel-Cobalt-Copper, Uranium-REE and Gold-PM conferences for free download (1440+ papers). The library is expanded regularly, providing a major ongoing free resource to the industry. A selection of papers from recent conferences is also available.



Alan has over 40 years' experience in the metallurgical, mineral and chemical processing industries in Australasia, New Zealand, North and South America, Africa, Asia and Europe. He has worked in metallurgical consulting, project development, engineering/construction, plant operations, plant start-up and technology development. Projects and studies have involved copper, gold/silver, nickel/cobalt, uranium and base metals.

Since 1985, as an independent metallurgical consultant, Alan has undertaken feasibility studies, project assessment, project development, supervision of testwork, flowsheet development, basic engineering, supervision of detailed engineering, plant commissioning and peer reviews and audits. Clients have included a variety of major and junior mining, exploration and engineering companies throughout Australia and overseas.

Extensive experience in:	...including
<ul style="list-style-type: none"><li>• Gold/Silver</li><li>• Copper</li><li>• Nickel/Cobalt</li><li>• Uranium</li><li>• Base Metals</li></ul>	<ul style="list-style-type: none"><li>• Leaching: atmospheric, heap, in-place, bio. and pressure</li><li>• Cyanidation and CIP/CIL</li><li>• Solid/liquid separation</li><li>• Flotation</li><li>• Electrowinning and electrefining</li><li>• Solvent extraction/ion exchange</li></ul>

## Call for Papers

### About the Conference

**ALTA 2020** is a world-class annual metallurgical conference, **celebrating its 25th year**, and a leading platform for innovation. We are pleased to partner with **CSIRO Mineral Resources** for the ISR sessions and **Curtin Gold Technology Group** for the Gold-PM sessions.

The emphasis of the program is practical rather than academic, and the themes running through the conference are the various aspects of technology and project development.

Held over eight days, it comprises five technical conferences, three short courses, and a trade exhibition. It features highly-focused programs, topical forums and key international speakers.

An outstanding platform for exposing the latest worldwide developments in plant operations, process technology, new projects, testwork and scale-up, process modelling and control systems, application of mineralogy and geometallurgy, R&D, equipment, reagents, materials, tailings disposal and environmental alleviation.

PROGRAM OVERVIEW								
Saturday 23 May	Sunday 24 May	Monday 25 May	Tuesday 26 May	Wednesday 27 May	Thursday 28 May	Friday 29 May	Saturday 30 May	
SHORT COURSE	SHORT COURSE	CONFERENCE SESSIONS					SHORT COURSE	
A-Z of Copper Ore Leaching	SX and its Application to Copper, Uranium & Nickel-Cobalt	<b>Nickel-Cobalt-Copper</b>  Including <b>Hydromet Processing of Ni-Co-Cu Sulphides</b> Forum & Panel			<b>Uranium-REE</b>  Including <b>Application of Membranes</b> Forum & Panel  <i>in parallel with</i>  <b>Gold-PM</b>  Including <b>Fit-for-Purpose Leaching Systems</b> Forum & Panel		<b>In Situ Recovery</b>  Including <b>Enhancing ISR Permeability</b> Forum & Panel  <i>in parallel with</i>  <b>Lithium Processing</b>  Including <b>Innovations in Lithium Processing</b> Forum & Panel	Uranium Ore Processing
		Welcome Reception	Conference Dinner		Happy Hour			
EXHIBITION								

### Submit an Abstract

Visit the [ALTA 2020 website](#) and submit your abstract early to sure a place in the program.

*Benefits of participation include*

- **50% off** registration fees (one per paper).
- Sole Consultant presenters receive **75% off** registration fees.
- Network with other presenters at the Presenter Briefing, unique to ALTA conferences.
- Promotion via LinkedIn and ALTA website.
- Proceedings and single papers are marketed globally for 18 months, before being added to the **ALTA Free Library**, a widely-used free resource for the metallurgical industry.

Thank you to our Partners and Co-Sponsors