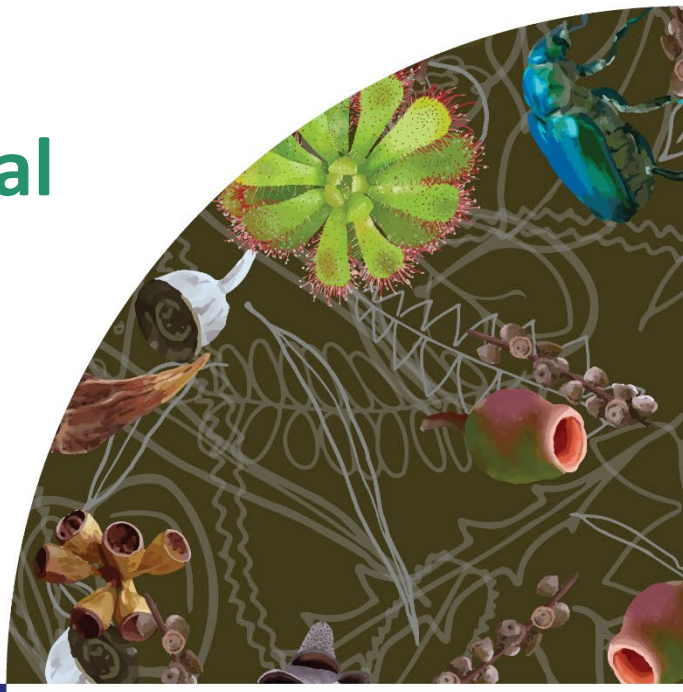
The 24th International Biohydrometallurgy Symposium 2022

Biotechnology for resource sustainability and circular economy



Program

20-23 November 2022

Rendezvous Hotel Scarborough, Perth, Western Australia (WA) and online

Hosted by
the Commonwealth Scientific and Industrial Research Organisation (CSIRO)
in collaboration with Curtin University

IBS 2022
20-23
November
Perth, Australia

Time	Wednesday 23.11.2022	
8:30	**Arrival tea/coffee, Mentelle and Mentelle Pre-Function Area**	
9:00-10:30	**Preston B+C** **Plenary session 3** **Biostabilisation, bioremediation and ecological restoration (T5) and Biomining microbiology, molecular biology, systems biology and synthetic biology (T6)** Chairs: Sabrina Hedrich (TU Bergakademie Freiberg, Germany), Himel Nahreen Khaleque (CSIRO, Australia)	
9:00	**Keynote Presentation** **Biofilm lifestyle of bioleaching microorganisms** Mario Vera (Pontifical Catholic University of Chile, Chile) OK-T6-176	
9:30	**Bioleaching community dynamics during adaptation and process upscaling of a secondary polysulfidic ore** Catherine Joulian (BRGM, France) O-T6-098	
9:45	**Directed evolution biology in resource technology – From the identification of novel inorganic -binding biomolecules to their provision in future** Robert Braun (Helmholtz-Institut Freiberg für Ressourcentechnologie (HIF) Helmholtz-Zentrum Dresden - Rossendorf e.V. (HZDR), Germany) O-T6-133	
10:00	***Sporosarcina globispora* and *Glutamicibacter protophormiae* - two ureolytic strains with high potential in revalorization of heavy-metals** Maria Dąbrowska (University of Warsaw, Poland) O-T5-044	
10:15	**Can microbially-induced calcite precipitation alleviate the traditional shortcomings of the Co-disposal method?** Ishaaq Hajee (University of Cape Town, South Africa) O-T5-105	
10:30-11:00	**Morning tea and networking, Mentelle and Mentelle Pre-Function Area**	
Technical Sessions	**Preston B**	**Preston C**
11:00-12:30	**Technical session 5A** **Biomining microbiology, molecular biology, systems biology and synthetic biology (T6)** Chairs: Chris Bryan (BRGM, France) and Melissa Corbett (Curtin University, Australia**)**	**Technical session 5B** **Biostabilisation, bioremediation and ecological restoration (T5) and Biological mineral formation and minerals exploration, biogeochemistry and biosensors (T7)** Chairs: Sabine Willscher (University of Halle, Germany), Ka Yu Cheng (CSIRO, Australia)
11:00	**A study of microbial induced changes on the surface of monazite** Abolghasem Hedayatkhah (Curtin University, Australia) O-T6-070	**Mechanisms of antimony migration and transformation at iron-based mineral interfaces driven by acidophilic microorganisms** Shichao Yu (Central South University, China) O-T5-085
11:15	**A microbial cell surface display system for nickel and cobalt recovery** Audrey Stephanie (Tohoku University, Japan) O-T6-149	**Antibacterial activity against pure and mixed cultures of *Acidithiobacillus ferrooxidans* (Peru)** Jasmin Hurtado (Universidad Peruana Cayetano Heredia, Peru) O-T5-063
11:30	**Encapsulin engineering for metal nanoparticle formation** Matthew Scheier (The University of Edinburgh, UK) O-T6-135	**Bio-accumulation of rare earth metals from vein-deposit monazite** Sadia Ilyas (Hanyang University, South Korea) O-T7-167
11:45	**Glutathione-binding proteins in sulfur-oxidizing acidophile *Acidithiobacillus ferrooxidans*** Jiri Kucera (Masaryk University, Czech Republic) O-T6-138	**Arsenite and arsenate removal from acidic mine waters using an acidophilic sulfate-reducing bioreactor** Ivan Nancucheo (Universidad San Sebastián, Chile) O-T5-126

[IBS 2022] Abstract

Bio-accumulation of rare earth metals from vein-deposit monazite

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Abstract: The eventual consumption and increasing role of rare earth metals (REMs) in advanced technologies are creating immense pressure to exploit the low-grade ores. The vein-deposits monazite of South Korean iron ore mines requires economic processing to balance the low concentration of REMs therein. In this context, the bio-accumulation of REMs was studied using fungi, *Aspergillus niger,* which not only attacks to phosphate matrix of the monazite but also excretes REMs-binding organic acids. The potential role of microbial activities in REMs enrichment from monazite was revealed by forming the insoluble oxalates. A detailed study on influential parameters showed that the prolonged exposure of monazite to a culture of *Aspergillus niger* in modified Czapek-Dox medium could enable the dissolving of more than 73% of phosphorus. The simultaneous conversion of REMs phosphate into oxalate salt was evident by the patterns acquired by X-ray diffraction and Fourier transform infrared analysis, while scanning electron microscopy of the residual mass revealed the irregular shapes of the bio-accumulated REMs. The stepwise mechanism involved in the bio-accumulation phenomenon is underpinned, as follows: (i) breaking of the phosphate matrix, (ii) liberation of iron and rare earths from the mineral particles, and (iii) their subsequent conversion into insoluble organic compounds.

Keywords: bio-accumulation, fungi, low-grade monazite, rare earth metals,

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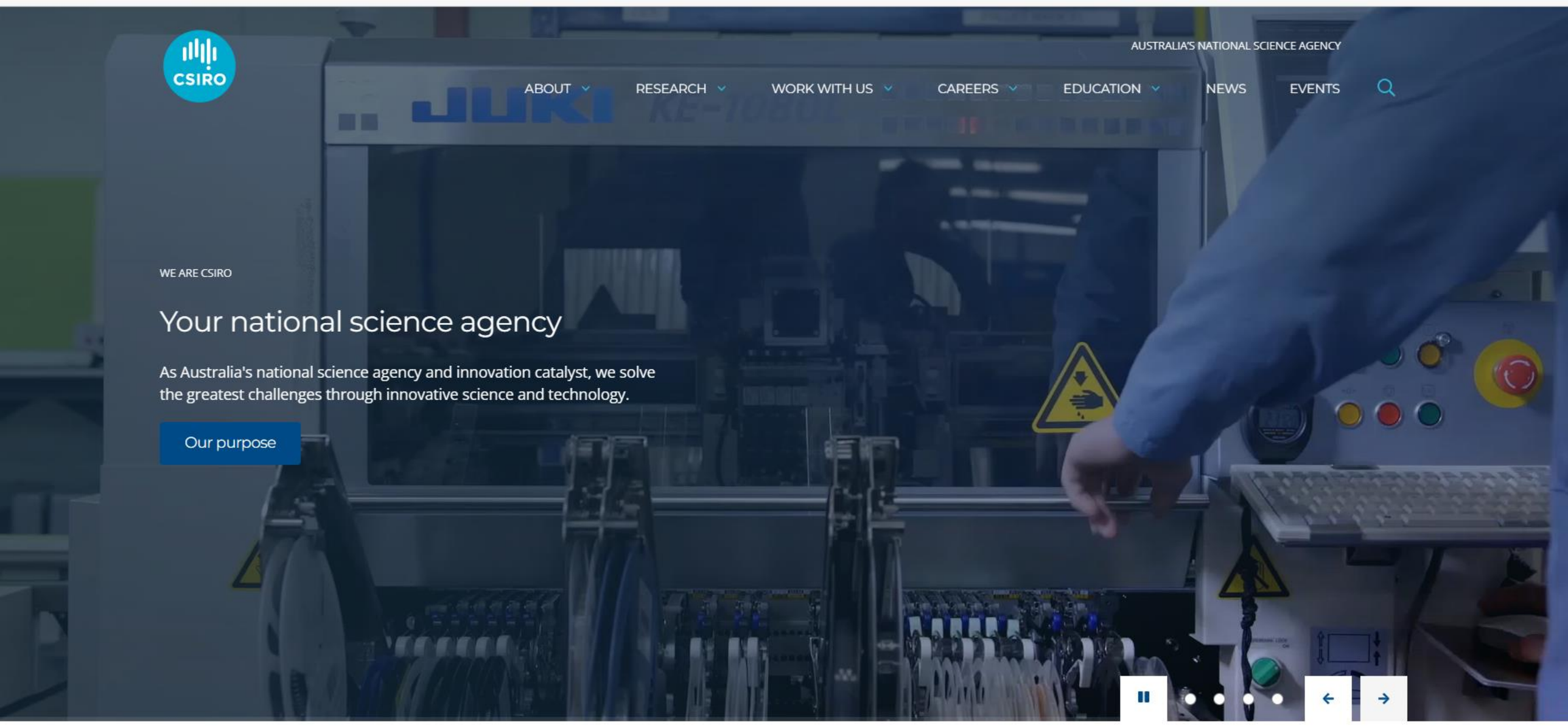
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