

Research progress towards the unlocking of in-situ recovery

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ABSTRACT

In-situ recovery (ISR), which uses solution injection underground for metal dissolution and further processing at the surface has received renewed interest in the mining field, largely because of its potential economic, environmental, safety and sustainability benefits. The Commonwealth Industrial and Scientific Research Organisation (CSIRO) has focused on collaborative research to unlock new applications of ISR outside of the traditional commodity of focus, namely, uranium mining. Research has focused on areas that are critical to ensure successful implementation of ISR from a technical, social and environmental perspective. Three important technical components in ISR include: (i) containment and hydrogeological control; it is essential that fluid pumped underground be retained at the site of interest and not contaminate groundwater. (ii) Leaching; the minerals of interest should be leachable, with good in-situ chemistry, including solution stability, dissolved metal stability and minimal gangue effects. (iii) Access creation is vital to allow for solution contact with the minerals of interest, and techniques to improve access in hard rock environments require development. An overview of projects and research outcomes to date by CSIRO and our many collaborators in the three technical areas, including progress made on evaluating potential conventional and novel barriers for fluid containment; an evaluation of stable and environmentally compatible lixiviants for ISR and alternative access creation methods, such as cryogenics, high-voltage and microwaves will be discussed. Social and environmental research is a critical component and underpins the technical requirements in ISR. A social licence framework that incorporates procedural fairness, distributional fairness and confidence in governance will be highlighted and an environmental scorecard approach, which focuses on a management and communication tool for the life of the ISR operation will be discussed.