

IN-SITU RECOVERY KEYNOTE PRESENTATION

CONSIDERATIONS FOR HARD ROCK IN-SITU MINING IN AUSTRALIA

By

Ewan Sellers, Ebrahim Fathi Salmi, and Joshua Rowe

CSIRO Mineral Resources, Australia

Presenter and Corresponding Author

Ewan Sellers

ABSTRACT

In-situ recovery (ISR) is typically defined as drilling from the surface to access ores that are amenable to chemical lixiviants. When these lixiviants flow through a porous and fractured orebody they extract the mineral content to various degrees, which is separated from the fluids. Hard Rock In-Situ Mining (HRISM) has been proposed since the 1980s with early work performed at the US Bureau of Mines. Access may be from the surface or of the underground and use new or existing infrastructure. In most cases, uranium has been a target mineral for ISR due to favourable geology and issues for conventional mining. Currently, mines extract other metals such as copper; mostly in Kazakhstan and starting in the USA. These orebodies are favourable for ISR mining due to their large oxide content and high permeability.

ALTA conference series has, since about 2016, been considering the ISR work carried out in Australia and other countries. Research continues to evolve to develop a range of lixiviant and access technologies. The energy transition is driving intensive searches for novel and energy-efficient methods of extracting minerals so this paper will explore some of the recent Australian developments and implications for HRISM operations locally.

As part of the identification of HRISM opportunities, we consider the geological framework of Australia as a start to understanding the location of ores, challenges, and opportunities. We briefly consider the stress, strength, and temperature regimes that would be encountered in Australian conditions and the implications for HRISM. Some ideas for linking HRISM to the energy transition and implications are the object of considerable research within CSIRO. For fun, we look at what Artificial Intelligence/Machine Learning (AI/ML) image generation suggests as technology options and find out that interpolation of the past cannot predict the future.

Keywords: In Situ Recovery, ISR, Hard Rock, In-Situ Mining, (HRISM), Uranium, Copper, Artificial Intelligence, Machine Learning, (AI/ML)