

RARE EARTH PRODUCTION FROM AN AUSTRALIAN CLAY HOSTED DEPOSIT

By

Jess Page, and Chantelle Bardadyn

Wallbridge Gilbert Aztec, Australia

Presenter and Corresponding Author

Chantelle Bardadyn

ABSTRACT

Australian Rare Earths (AR3) is progressing feasibility studies and approvals for their Koppamurra Project in South Australia-Victoria, rich in clay hosted rare earth elements (REE) that are critical to producing renewable energy technologies and de-carbonising the world's energy landscape. The Project is led by a highly credentialed team, supported by world class consultants and advisors with proven expertise in the rare earths and mining industries.

AR3, in collaboration with Wallbridge Gilbert Aztec (WGA) metallurgists and process engineers, and experts from ANSTO, SGS Lakefield and University of Toronto, have substantially progressed a comprehensive metallurgical test work program to evaluate and select a process for economic recovery of the REEs from the deposit. The flowsheet evaluation is supported by robust data collection and storage by the WGA Data Analytics team, who have securely consolidated drilling and test work data, and identified geometallurgical relationships through machine learning applications.

Understanding the ore's metallurgical response is critical for developing an economic process flowsheet. Through mineralogical studies, bench-scale beneficiation and extraction tests and a recent large-scale test work program, a preliminary process flowsheet has been developed and continually updated based on insights derived from test work. The following insights have recently been derived:

- Leach optimisation test work conducted at ANSTO and University of Toronto demonstrated an average recovery of 65%, up to 77% of the four key magnet REEs, being Nd, Pr, Dy and Tb, in the pH range 1.5 to 2.0 at ambient conditions. This recovery was maintained whilst significantly reducing acid consumption from the dissolution of the gangue minerals, iron and aluminium, by 50%. Further leach tests on samples from spatially diverse locations within the deposit, provided consistent metallurgical response to varied pH, leach time and solids density, despite the geographic spread.
- Solid-liquid separation experts, Metso Outotec and GBL / IFS have progressed test work to develop process technology selection and determine optimal separation conditions.
- Bench-scale size separation test work at SGS showed early potential for >30% mass rejection and >50% gangue mineral rejection in a coarse waste stream, whilst maintaining REE grade in the product stream. This may provide both an opportunity to reduce material throughput and acid consumption, leading to commercially attractive equipment sizing and reagent requirements.
- An 850 kg composite sample extracted from the Koppamurra Trial Pit was processed by ANSTO in December 2022 for generation of a mixed rare earth carbonate and product specification analysis. This significant step change in the scale of test work, covering the entirety of the process flowsheet, will inform design and operational criteria for testing of a 500-tonne bulk sample even larger scale testing and piloting.

These insights provide both an environmentally sound and commercially attractive process pathway to economic production of a high-quality specification REE product. Pipeline test work in further optimising particle size separation, solid-liquid separation, impurity removal and carbonate precipitation will contribute to finalising the process flowsheet and provide key inputs to both the mining lease application and a scoping study.

Keywords: Rare Earth Elements, Clay Hosted, Renewable Energy Technologies, Mining Lease Application