An introduction to clay-hosted REE projects in Australia

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# ABSTRACT

Rare earth elements (REEs) are in high demand due to their application in renewable technologies and electromobility. Recent REE exploration has focussed on clay-hosted REE deposits that contain a high proportion of valuable heavy REEs (including terbium and dysprosium. Research to date has been largely restricted to clay-hosted REE deposits in China, and little is known about the mineralogy and viability of REE clay projects in Australia.

Clay-hosted REE deposits are typically low-grade and high-tonnage in contrast to hard rock REE deposits. Thirteen Mineral Resource Estimates have been completed in Australia that have a median grade of 840 ppm TREO (total rare earth oxide) and 98 million tonnes (Mt) across all resources. In total, we identified 88 clay-hosted REE projects in Australia, most of which are in the Yilgarn Craton, Albany-Fraser Orogen, and the Gawler Craton with emerging projects in the Delamerian Orogen and NE Queensland.

To address geological, mineralogical, and geochemical knowledge gaps, RSC instigated a research project in June 2023 co-funded by the Minerals Research Institute of WA (MRIWA), RSC, and eight participating exploration companies (Auric Mining, Dreadnought Resources, Golden Mile Resources, HRE, MTM Critical Metals, Mount Ridley Mines, Terrain Minerals, Voltaic Strategic Resources). In this study, we examined the mineralogical and geometallurgical characteristics of 80 samples from eight clay-hosted REE projects using scanning electron microscopy (SEM), X-ray diffraction (XRD), and various geochemical analyses. Here, we present results from four geochemical techniques (ionic leach test, weak-acid digest, four-acid digest, flux fusion analysis) and compare REE abundances with findings from our microcharacterisation study. This holistic approach allows to understand the deportment of REEs within the regolith profiles across different projects and geological conditions.