

Characterisation of Clay-Hosted Rare-Earth Element Deposits in Australia

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Rare earth elements (REEs) are critical for renewable technologies, electromobility, and the defence industry. While research has focused on ionic clay-hosted REE deposits in South China and Madagascar, little is known about the mineralogy and economic viability of clay-hosted REE projects in Australia. Australian clay-hosted REE deposits have seen 90 new discoveries in the past four years due to strong global demand. Our research focuses on the deportment of REEs in regolith, crucial for developing effective processing strategies. Results indicated an abundance of relict primary monazite in the plasmic zone, with minor relict bastnaesite, allanite, xenotime and fergusonite. Secondary REE minerals in the regolith include rhabdophane, secondary bastnaesite, cerianite, aluminium phosphate sulphate (APS) minerals, and churchite. These relict primary minerals and newly formed secondary REE minerals dominate the deportment of REEs in the plasmic zone. The clay mineralogy is primarily kaolinite and halloysite. The study found overall low ionic REE proportions with an average of ~2%, highlighting the need for further research on processing pathways for REEs locked in minerals. The prevalence of REE phosphates and fluorocarbonates suggests that current exploration often uncovers non-ionic REE mineralisation, necessitating strategies to recover REEs from minerals like REE phosphates.