

ECONOMIC AND TECHNICAL CHALLENGES OF NON-CHINESE CLAY HOSTED RARE EARTH DEPOSITS

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ABSTRACT

The primary source for the world's heavy rare earth elements (HREE) are exploited from the ionic adsorption deposits (IADs) in Southern China. These regolith hosted IADs are also often referred to as ion-adsorption clays due to the fact that the REs can be displaced from the clay minerals using solutions of a high ionic strength salt (predominantly ammonium sulphate). Typically, the method of mining and extraction used is in-situ leaching, hydraulic sluicing or heap leaching with the key requirement that the clays give up their weakly bound rare earths via a cationic exchange mechanism. Although these deposits are low grade compared to hard rock or alluvial deposits, the high proportion of valuable HREEs and the low mining and extraction costs is perceived to offer economic advantages over other deposit types.

In recent years, many low-grade clay hosted rare earth deposits have been reported outside of China. Very few of these have proven to date to be truly IAD in nature. Many companies have announced to have a significant weak acid extractable (WAE) rare earth content, however this is only part of the equation and introduces other challenges such as additional chemical costs required for purification, increased water requirements for residue washing and costly wastewater treatment/disposal requirements. Lastly, the assumed revenue from products is often simplistically and erroneously overstated by applying separated rare earth basket prices (perhaps with a discount factor) for the assumed saleable product.

A top-down analysis is presented discussing macroeconomic variables in context with the idiosyncrasies of treating both IAD and WAE rare earth feed types.

Keywords: clay hosted rare earths, ionic clay, rare earth elements, HREE