South Australia becoming the ‘Holy Grail’ of the rare earths space

*By **Robin Bromby** - May 31, 2022*

South Australia’s ionic clays are much more attractive than hard rock rare earths deposits.

The rare earth elements (REE) target is ionic adsorption clay deposits — and the prime location is South Australia.

These clays contain all the four key elements for magnets used in electric vehicles, wind turbines and much else: neodymium, praseodymium, dysprosium and terbium.

In electric vehicle (EV) motors, the typical neodymium-iron-boron magnet is made up of between 29% and 32% of neodymium and praseodymium with between a further 4% and 9% of its mass being terbium and dysprosium.

But that extra small amount of the latter two elements increases the maximum operating temperature of the magnet from about 60 degrees Celsius to up to 240^{o}C, a factor crucial for EV traction motors. Iron makes up most of the rest of the mass with 1% being boron.

This means that the economics of ionic clays are much more attractive than the hard rock rare earths deposits.

Unlike hard rock deposits, these clay deposits are shallow, require negligible blasting, there is no crushing or milling involved, and no uranium or thorium radioactive tailings to deal with.

You can extract the key magnet rare earth elements you want — and don't have to worry about the others, meaning that miners will not have their "basket price" pulled down by low value lanthanum and cerium.

That is why London-based mining analyst, Christopher Ecclestone of Hallgarten & Co, recently dubbed the ionic clay deposits the "Holy Grail" of the rare earths sector.

Five key players make up the SA REE rush

The companies to watch are iTech Minerals (ASX: ITM) — which discovered the clay deposits while exploring its Eyre Peninsula kaolin project — along with Taruga Minerals (ASX: TAR), Resource Base (ASX: RBX), Australian Rare Earths (ASX: AR3) and that company's neighbour Lanthanein Resources (ASX: LNR) (formerly known as Frontier Resources).

The relative ease of mining these clays — and the resulting improvement of economics of rare earths production — is not the only key factor.

That other factor: China is running out of its clay-hosted heavy rare earths — which have enabled it to continue to dominate the global rare earths space — and is now reliant for about half its supplies from Myanmar.

This supply crisis was foreseen in a 2013 paper that came from Beijing University's environmental science and engineering department which spelled out that China's heavy rare earth resources would be exhausted within 10 to 15 years — and nine years of that has already elapsed.

REE-bearing clays discovered 50 years ago

The clay deposits were discovered in 1970 at Ganzhou, in the Jiangxi province, with other discoveries following in the other southern provinces of Guangdong, Fujian, Zhejiang, Hunan, Guangxi and Yunnan.

The main ore bodies lie between 5m and 30m from surface, so the rare earths can be extracted by open cut mining followed by heap leaching.

While these clays account for only 2.9% of China's total rare earth reserves, they are vital to that country; between 1988 and 2007, the clays accounted for 26% of total REE production, rising to 35% in 2009.

However, there have been output reductions more recently as China imposed stricter environmental controls and also clamped down on illegal mining.

The South Australian breakthrough comes against a background of tightening Chinese control of rare earths, now being put into effect by the merger of the three producers in China — China Minmetals Rare Earth, Chinalco Rare Earth & Metals and China Southern Rare Earth Group.

Explorers now in high gear

Earlier this month, Taruga Minerals reported that samples from its Morgan's Creek project, located on the Adelaide fold belt, had confirmed the presence of high-value rare earths in clay which will allow for a simple metallurgical flow sheet.

In the clay zone, the company reported an average recovery of 85% of total rare earth oxides (TREO) and 93% of the higher-value magnet TREO.

Taruga had to date focused on copper at Morgan's Creek but said the presence of ionic rare earths represented a significant value-add.

Also this month, Resource Base announced what it termed "extremely" good results from shallow air core drilling at its Mitre Hill project, which is located in the Murray Basin straddling the Victoria-South Australia border.

Drilling hit mineralisation 3m from surface assaying 1m at 1,421 parts per million TREO and another hole intersected 1m at 1,090ppm (5m from surface).

iTech Minerals also had success in mid-May at its Ethiopia kaolin prospect on Eyre Peninsula.

Reporting on the assays from the first 23 of 115 drill holes, the company said the results confirmed substantial intervals of REE in clay, including 12m at 1,057ppm from 7m.

Australian Rare Earths recently began a small-scale trial mining program at its Koppamurra project near Naracoorte in South Australia, the work aimed at improving its understanding of the clay (they vary in style from deposit to deposit) as well as collecting bulk samples for metallurgical work.

Its neighbour, Lanthanein Resources has begun working through records for its Murrayduim project ahead of planned drilling.

And in April, Petratherm (ASX: PTR) — a veteran of the short-lived hot rocks energy phase — said drilling at its Comet project in the northern Gawler Craton on South Australia uncovered "major" high-value rare earths.

Shallow rotary air blast drilling tested the top of the prospective clay horizon and intersected REE which remain open at depth and out into surrounding areas.

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