

Sydney Morning Herald
Monday 14/09/2020

Page: 15
Section: General News
Region: Sydney, AU
Circulation: 74348
Type: Capital City Daily
Size: 1,066.00 sq.cms.



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Race against China's 'rare earths weapon'



The Lynas rare earth mine in WA. Lynas has a processing deal with the Pentagon.

Beijing's apparently cavalier attitude towards soil, water and air pollution is giving it an edge in the market, writes **Eryk Bagshaw**.

If you have a phone, camera or an electric car, chances are each of these devices are wholly dependent on key minerals that, at the moment, are processed only in

China.

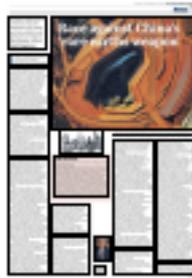
For much of the past two decades, this has been fine: a status quo that rewarded low-cost production in China with exports around the world. The global economy was growing, more smartphones were being sold than there were people and the electric vehicle market was burgeoning.

Now, as supply lines shrink, geopolitical tensions rise and the world's dependence on these minerals for everyday use surges, policymakers are coming to terms with a gaping hole in the world's development of rare earths that threatens to hit militaries as much as it does consumers.

There are 0.15 grams of palladium in an iPhone, 472 kilograms of combined rare earths in an F35 fighter jet and four tonnes in a Virginia-class submarine.

Says federal Resources Minister Keith Pitt: "Some of these things the government stockpile levels are very, very small in terms of weight. They are kilos compared to tonnes. That is how rare the element is."

Europium oxide, which is used to produce the colour red in household TVs, comes from a global europium stockpile of just 20 tonnes. Stock of ferro dysprosium, used in some magnets, is less than 500 kilograms.



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But it is graphite, a key component of the lithium-ion batteries in phones, laptops, military and medical equipment and electric cars, that has sparked the most heated minerals race. Turkey, China, Brazil and Mozambique have the world's largest graphite reserves but only China has the technology and scale to purify the mineral into graphene and other battery anode compounds to make it useful.

Says Andrew Spinks, managing director of EcoGraf, an Australian company set to become the first local processor of graphite in the country: "There is no other supplier in the world except China producing this material.

"It is the most electrically conductive mineral known. The next most conductive mineral is gold."

China has declared graphite a strategic mineral. It has 195 mining areas across 20 provinces that account for 70 per cent of the world's exports of processed graphite resources. Its dominance and proliferation-brand of state-linked companies has sharpened the concerns of governments that in the event of a shortage or a military dispute in the South China Sea, the tap could be turned off.

"It does not matter if you are importing loaves of bread or anything else, if you only have one supply line, that is an increased risk," Pitt says in an interview in Canberra.

In the last few months of 2019, China had begun winding back its exports, well before its relationship with the US, Australia and Europe was pummelled by the coronavirus and China's crackdown in Hong Kong. From August to September 2019 alone, rare earth exports from China to the US dropped by 18 per cent.

Australia, which has historically focused on more common, highly profitable exports like iron ore, is sitting on a graphite reserve in South Australia of 200 million tonnes.

Says Professor Dusan Losic: "You are touching my nerves."

Losic, director of Australia's graphene research hub, which collaborates between five Australian universities including the University of

Melbourne and the University of Adelaide, says: "We have very huge reserves just sitting down there. But nothing can be done with a lack of investment."

The government has committed \$125 million to exploring two 2500 kilometre long corridors in the hope of hitting another rare earths payload. One stretches from the Gulf of Carpentaria down to the borders of NSW, South Australia and Victoria. The second runs from Darwin to the Great Australian Bight. It has also invested \$4.5 million in critical mineral

research and development through the CSIRO and Geoscience Australia but industry figures say it is not enough. Losic says the cost of starting up a single graphite processing plant is \$60 million.

Perth USAsia Centre research director Dr Jeffrey Wilson says Australia has abundant geology and technical capabilities, but the investment risk is higher than the private sector can manage.

"China holds a global monopoly on the production of rare earth minerals, which are used across the civilian and defence technology ecosystems," he says. "With China applying trade sanctions to many countries in early 2020, there is a real risk the rare earths weapon may be deployed in the coming months."

Australia signed a strategic partnership in June that will allow for Australia to supply rare earth resources to India. Another deal with the US followed in July after Australian rare earth miner Lynas announced it would process the minerals at a Texas facility in partnership with the Pentagon. Australian resources company Syrah is also establishing a production line, in the US state of Louisiana, that will be the first to completely transform graphite into the active anode material used in electric vehicles outside of China.

Pitt says the world is watching Australian right now. "I think every Australian will recognise how critical this is in terms of our nation. It is also about our strategic partnerships as

well. That is why we are working very closely with South Korea and Japan and the US, Europe and a lot of other countries," he says.

"They recognise it is in their interests to have a diverse source of materials into their countries, not just a single one."

Lynas says COVID-19 has heightened the focus on resilient

supply chains and securing a diverse supply of critical minerals.

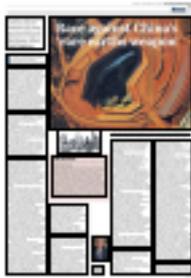
A Lynas spokeswoman says: "It's only when there is a risk that a component like rare earths will not be available, that it comes to the attention of business leaders."

One of the reasons for China's dominance in processing graphite is its use of highly toxic chemicals in the purification process, which other countries have been reluctant to replicate. China's processors use hydrofluoric acid to remove impurities. The chemical is highly corrosive and discharges chemicals into surrounding land and water. Processing graphite also produces air pollutants that can cause respiratory illnesses.

Pitt says there is no intention to change any environmental controls to allow for more mining or processing. "If you work within that framework, you reduce the risk substantially."

EcoGraf has spent the past three years developing an eco-friendly purification process that will avoid hydrofluoric acid and the discharge of air pollutants. Its new plant, the first graphite purification facility in Australia, is set to be established in Kwinana, Western Australia, after the company secured investment from Export Finance Australia and the German government to source graphite from a mine in Tanzania.

Spinks says the establishment of an Australian Critical Minerals Office, headed by Jessica Robinson, a former senior official in Treasury and Prime Minister and Cabinet, is a sign of how seriously the government is taking the rare earths supply challenge. But he says more government support is needed to buttress the significant upfront costs of mining and processing the material.



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“If we don’t, we will just see battery minerals being shipped offshore for 1/100th of the price and then we have to buy it back,” he says. “That just doesn’t make any sense.”

Why so rare?

- ▶ Australia is the world’s No.2 producer, making up 13 per cent of global output
- ▶ Mined in Mount Weld and Browns Range, WA, Nolans, NT
- ▶ Used in: speakers, wind turbines, hybrid cars and magnets
- ▶ Rare earths are not that rare: A family of 17 obscure minerals found near the bottom of the periodic table, they occur everywhere in the Earth’s crust and in greater amounts than many other elements. Even the rarest of rare earth minerals, thulium, is more plentiful than gold
- ▶ Rare earths including cerium, dysprosium, erbium, neodymium, praseodymium, neodymium, scandium, cerium, lanthanum and lutetium are rare in the sense they are sprinkled all over the planet in very small concentrations.



Concerned:
Resources
Minister Keith
Pitt.

