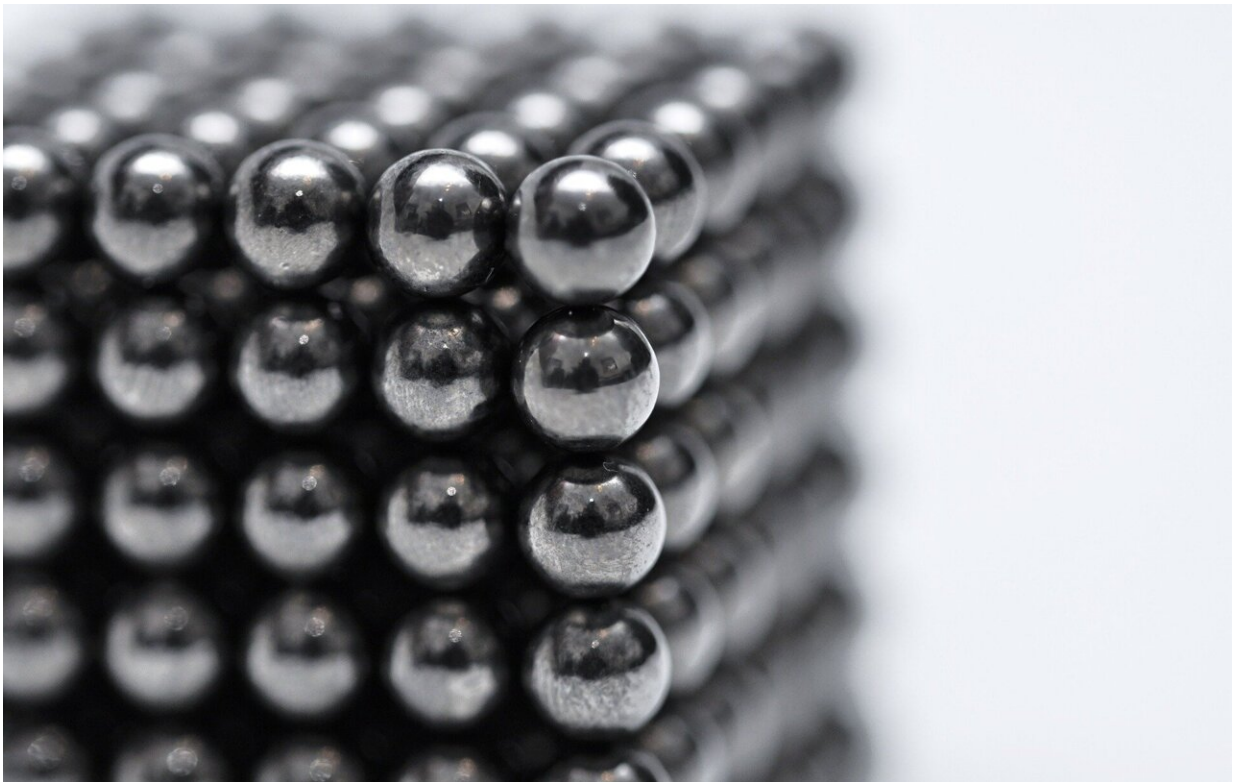


# Securing rare earths for Europe's high-tech industries

January 3 2024, by Michael Allen

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A group of critical raw materials may help Europe reduce supply-chain vulnerabilities.

Dr. Arne Petter Ratvik is championing high-tech goods for Europe

through a low-tech source: fertilizer.

Ratvik, a metals expert at independent Norwegian research organization SINTEF, says raw materials needed by the European auto, computer, electronics, energy and other industries can be extracted from ordinary fertilizer production.

## **Magnetic attraction**

Industrial magnets, for example, are made from raw materials known as rare earths located in the Earth's crust and are key components of everything from smartphones and tablets to refrigerators and microwaves.

"Rare earths from fertilizers could produce very good magnets," said Ratvik, a senior research scientist at SINTEF.

He led a research project that received EU funding to boost European supplies of rare earths by removing them during the fertilizer-manufacturing process. Called [SecREEs](#), the project ran for four and a half years through November 2022.

Ensuring Europe's access to raw materials has jumped to the top of the EU political agenda as geostrategic questions expose vulnerabilities in European supply chains.

Individual non-EU countries including China, the Democratic Republic of the Congo and South Africa have dominant control over some critical raw materials.

For example, China refines all the rare earths used in permanent magnets worldwide, according to the European Commission.

In March 2023, the Commission [proposed](#) to set EU targets of at least 10% for the extraction, 40% for the processing and 15% for the recycling in Europe of critical raw materials, including rare earths.

## Unearthed earths

Rare earths are comprised of 17 metallic elements with special properties that facilitate technological advances in a range of industries.

SecREEs focused on three rare earths that are key for the EU green-energy transition: dysprosium, neodymium and praseodymium—all used to make permanent magnets for electric cars and wind turbines.

Based on European fertilizer production, the extraction technique developed by the project team has the potential to cover around 5% to 10% of Europe's demand for dysprosium, neodymium and praseodymium, according to Ratvik.

"We developed an integrated extraction process within the fertilizer production process to take out the [rare earth elements](#)," he said.

Ratvik said that, for example, phosphate rocks used to make fertilizer contain between 0.3% and 1% rare earths. Currently, these elements just end up in the final product without giving it any extra value.

Phosphate fertilizer is produced by dissolving phosphate rocks in acid. In subsequent steps, unwanted elements are turned into solids and filtered out—a chemical process known as precipitation.

To achieve its technique, the SecREEs team included an extra precipitation step allowing rare earths to be removed from the fertilizer production stream.

As part of the project, the rare earths were further processed and then sent to magnet producers in Germany and the UK.

The activity resulted in powerful, high-performance magnets, according to Ratvik.

## Overseas influences

While he ponders ways to deploy the SecREEtS extraction method on an industrial scale as well as potential obstacles resulting from Russia's war in Ukraine—both countries are major suppliers of phosphate rocks for fertilizer production—another researcher in Europe is exploring how two EU partner nations in Asia tackle supply-chain challenges.

Dr. Jewellord Nem Singh, an expert in [critical minerals](#) and industrial policy in the Netherlands, is in the midst of visits to Japan and South Korea to discuss the matter with government and industry representatives there.

Based at the International Institute of Social Studies in The Hague, Nem Singh leads an EU-funded research project on the geopolitical implications of rare earths. Called [GRIP-ARM](#), the project runs for five years through January 2026.

The initiative focuses on China, Brazil and Kazakhstan as mineral-producing countries and on the EU, Japan and Korea as consumers of rare earths.

The GRIP-ARM researchers are examining ways for the EU to secure future supplies of these raw materials while reducing the socio-environmental costs of extraction.

"Part of what we are trying to understand are the conditions that have led

to specific decisions of governments and businesses around the question of how to secure access to critical minerals," said Nem Singh.

## Processing power

He said that China's economic advantage in [rare earths](#) comes not only from controlling roughly 60% of known global reserves but also from extraction and processing.

"China, since the 1970s, has put a lot of money into refining, separation and processing technologies," Nem Singh said.

Rare earths from anywhere in the world must be sent to China because it has the processing plants and expertise.

In addition, it has created long supply chains—from mining through processing to manufacturing final products, including electric cars, medical devices and solar panels. That adds to the country's economic leverage, including over [rare-earth](#) prices.

Nonetheless, China still relies on other countries to produce the most technologically advanced versions of some products, according to Nem Singh. For instance, he said that Japanese companies still make better permanent magnets.

"What China is trying to accomplish is to fully complete that loop from mineral extraction all the way to final products of high-tech and advanced manufactured goods," Nem Singh said.

## Fine balance

That means other nations have opportunities to rebalance relationships

with China while accepting its role as a major industrial player.

"The EU already recognizes that China is a strategic partner," said Nem Singh. "But it is also an EU competitor, so we need to figure out how to build a relationship with China along those lines."

He cited the example of Germany's current push—with [EU support](#)—to expand semiconductor manufacturing after three decades of declining market share in the face of heightened global competition.

While this could create a high-tech industry in Europe decoupled from China, Germany would still need to retain access to important Chinese minerals used by German carmakers.

The fundamental question that the EU faces—and that Nem Singh hopes to help answer through GRIP-ARM—is the scope for Europe to exclude China from key parts of the supply chain linked to core technologies.

"They need to figure out if they can produce these segments of the supply chain in Europe," he said.

### **More information:**

- [SecREETs](#)
- [GRIP-ARM](#)

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