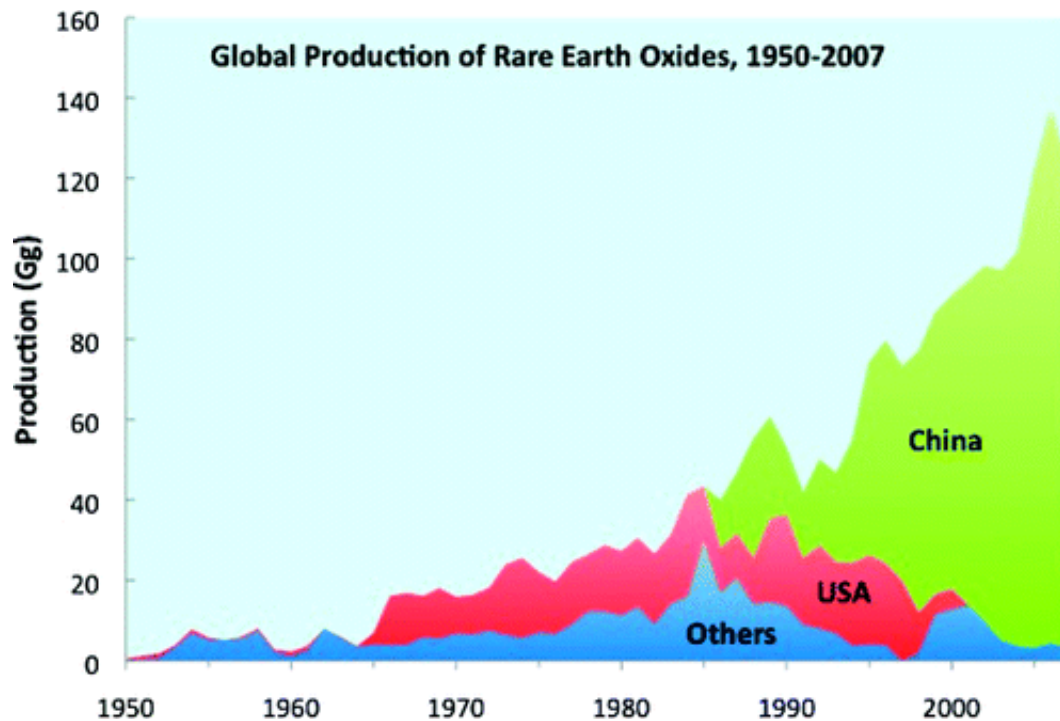


Recycling: A new source of indispensable 'rare earth' materials mined mainly in China

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That axiom of sustainability -- "recycle and reuse" -- could help ease concerns about a reliable supply of substances, indispensable for a modern technological society, that are produced almost exclusively in the Peoples' Republic of China. That's the conclusion of a study on these so-called "rare earth" elements in the ACS journal *Environmental Science & Technology*.

Xiaoyue Du and Thomas E. Graedel note that the dozen-plus [rare earth elements](#) (REEs) have unique physical and chemical properties making them essential for defense applications, computers, cell phones, electric vehicles, batteries, appliances, fertilizers, liquid crystal displays, and other products. But there is growing concern about the supply, since only one country, China, is the major source. "Since 1990, China has played a dominant role in REE mining production; other countries are almost completely dependent on imports from China with respect to rare earth resources," the researchers state.

To determine how much recycling potential of the REEs from in-use products could add to the supply, they did the first analysis of the amount of REEs available in products in the United States, Japan, and China. Those countries are the major uses of REEs. The analysis concluded that nearly 99,000 tons REEs were included in products in 2007. This invisible stock, equivalent to more than 10 years of production, "suggests that REE recycling may have the potential to offset a significant part of REE virgin extraction in the future...and minimize the environmental challenges present in REE mining and processing," the report notes.

More information: "Global In-Use Stocks of the Rare Earth Elements: A First Estimate", *Environ. Sci. Technol.*, 2011, 45 (9), pp 4096–4101. [DOI: 10.1021/es102836s](https://doi.org/10.1021/es102836s)

Abstract

Even though rare earth metals are indispensable in modern technology, very little quantitative information other than combined rare earth oxide extraction is available on their life cycles. We have drawn upon published and unpublished information from China, Japan, the United States, and elsewhere to estimate flows into use and in-use stocks for 15 of the metals: La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, and Y. Here, we show that the combined flows into use comprised about

90 Gg in 2007; the highest for individual metals were 28 Gg Ce and 22 Gg La, the lowest were 0.16 Gg Tm and 0.15 Gg Lu. In-use stocks ranged from 144 Gg Ce to 0.2 Gg Tm; these stocks, if efficiently recycled, could provide a valuable supplement to geological stocks.

Provided by American Chemical Society

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