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Technology

Shortage of Rare Earth Elements Could Thwart Innovation

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Silicon may represent one of Earth's more common elements, but it transformed Silicon Valley into a high-tech corridor and helped usher the world into the Information Age.

Now rare earth elements with exotic names such as europium and tantalum hold the key to hybrid cars, wind turbines and crystal-clear TV displays — that is, if a looming supply shortage doesn't stop innovation in its tracks.

Rare earth elements, called "rare earths" by those who use and study them, often prove irreplaceable in green technologies and high-tech consumer products. Yet the world's production of rare minerals relies mainly upon China, and the Chinese government warned last year that its own rising demand will soon force it to stop exporting the precious elements.

"Countries and companies that have or plan to develop industries that need rare earth minerals to make products are concerned about China's growing consumption, which they fear will eliminate China's exports of rare earths," said W. David Menzie, chief of the international minerals section at the U.S. Geological Survey (USGS).

China has also encouraged companies that use rare earths to locate their manufacturing facilities in China, Menzie told TechNewsDaily. But some companies fear moving because of concerns about intellectual property protection, he added.

Deposits of rare earth elements exist in the United States, Canada and other countries. But only China's government supports the mining and refining industries capable of processing the resources from start to finish.

Jack Lifton, an independent consultant for U.S. rare earths, thinks it's time for the U.S. government to subsidize the creation of such industries to ensure a future supply, lest a shortage of rare earth elements cripple production of high-tech products.

Examples of rare earth elements used by the technology industry include:

Europium: This extremely rare but critical chemical makes the red color for television monitors and energy-efficient LED light bulbs. China is the only country today that produces europium, dysprosium and terbium, which are necessary for either boosting the efficient operating temperature of magnets or for producing red in color displays. In December, USGS scientists discovered Alaskan deposits of europium, but even the few U.S. companies that mine rare earth elements must send the resources to China for processing.

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Lanthanum: A primary component of the nickel-metal hydride battery in Toyota's popular hybrid car, Prius. The Prius also incorporates neodymium, praseodymium, dysprosium and terbium. Lifton estimates that Toyota may use as much as 7,500 tons of lanthanum and 1,000 tons of neodymium per year to build its Prius cars. That dependence on rare earth elements has prompted the company to search for alternative sources outside China.

Neodymium: This represents a main component of the permanent magnets at the heart of the most efficient wind turbines. China's own wind production efforts could consume all the available neodymium production and leave nothing for the rest of the world's booming wind industry, Lifton notes in a recent report titled "The Rare Earth Crisis of 2009." Neodymium is also used in the glass of incandescent light bulbs produced by General Electric, which has unsurprisingly invested in both Chinese and alternative sources of rare earth elements.

While the rare earth elements are crucial to the future of high-tech industries, some of these more basic elements – such as iron and aluminum – remain invaluable to basic infrastructure such as roads and communications needed to build a modern economy.

"If you are a developing country trying to build a manufacturing industry, the traditional ferrous (iron) and base metals can be very important as can construction materials such as cement and crushed stone," said Menzie of the USGS. "Countries such as China have been developing their manufacturing industries and require large amounts of iron ore, nickel, zinc and other alloying metals, as well as copper and fuels."

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