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UT Researchers Find Key Ingredient for Phones and Other Tech in Coal Ash

Rare earth elements revealed in byproducts

BY AMBER WILLIAMS, FRI., JAN. 3, 2025

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The U.S. has produced an unfathomable amount of coal in the last 70 years, and the ash byproduct could become helpful (image via Getty Images)

Rare earth elements. They live in your electric car batteries, cellphone camera lenses, and computer hard disks. They help refine petroleum and produce steel. They form important building blocks for renewable energy and national defense technology.

Abundant in Earth's crust, the 17 rare earth elements are not actually "rare." However, they usually appear in low concentrations with high economic and environmental costs to extract. Today, the U.S. relies almost entirely on China for its supply, which leaves us in a shaky geopolitical spot.

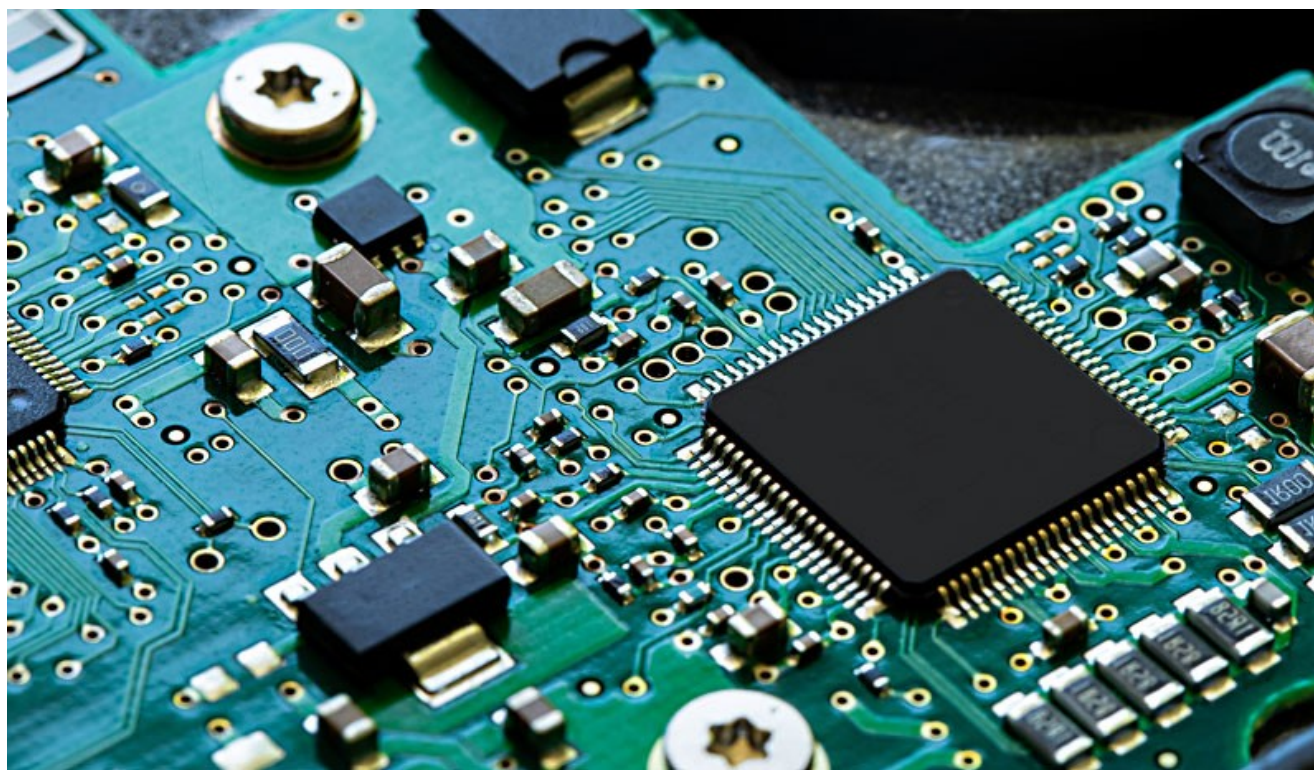
"We need to develop some of these resources ourselves," said Dr. Bridget Scanlon, a geosciences professor at the University of Texas. Scanlon is one of several researchers who authored a recent report that might help with this goal.

Published in **September**, the survey revealed that 11 million tons of REEs could be extracted from domestic coal ash stashes – a big jump from the current estimated U.S. reserves of 1.4 million tons.

Since the 1950s, the U.S. has churned out 52 gigatons of coal (a gigaton is a billion metric tons). A big chunk of those ash byproducts now sit in landfills and ponds, potentially releasing contaminants into water sources. Collecting the coal ash to extract these highly demanded elements could not only lessen the supply problem, but also help out the environment while also generating revenue to pay for the process.

Not all ash is created equal, however. Coal burnings from certain geological areas contain higher amounts of REEs than others, and identifying these levels is only the first step to extraction. “It’s important to consider not just the concentrations, but then, how readily can you extract them from the ash,” Scanlon said.

Today, the U.S. relies almost entirely on China for its rare earth elements supply.



Rare earth elements are important for microchips

Ash collected from a regional strip stretching from Alabama to New York holds roughly 430 parts per million REEs, but only 30% of them are extractable. On the other hand, ash from certain parts of Montana and Wyoming contains much less, about 280 ppm, but 70% can be extracted.

These numbers offer a promising start, but Scanlon says more work needs to be done to assess the financial viability of extraction processes. That's where ElementUSA, a waste-repurposing critical mineral production startup, comes into play.

"Our target is to develop a separation technique that's both technical and economic," said Chris Young, the company's chief strategy officer.

ElementUSA focuses primarily on using waste materials (like coal ash) for their production. As the economic, social, and environmental costs of holding on to waste grows, so does the interest in recycling it. "Ten years ago, even five years ago, the thought about repurposing – valorizing – waste was not very common," Young said. "You're hearing it much more often now."

Young said the company is relocating to Cedar Park in the first quarter of 2025 and entering a new partnership with the Jackson School of Geosciences at UT. This will enable the collaborators to share equipment, trade testing techniques, and expand research capacity.

Scanlon said working across fields and industries can spark fresh ideas: "You're not bogged down with what people have been traditionally thinking."

Going forward, Scanlon said there is potential for REE extraction in other recycled materials like activated carbon, road materials, and even roof tiles – all of which will continue to require a collaborative effort from researchers, government, and private businesses.

"We just have to do the foundational work," she said.

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