

# Gold rush-era discards could fuel cellphones, TVs (Update)

July 21 2013, by Tracie Cone



In this December 2012 photo provided by the U.S. Department of Energy, Ames Laboratory, materials scientist Ryan Ott, left, and research technician Ross Anderson examine an ingot of magnesium and rare-earth metals as part of a project to optimize the process to reclaim rare earths from scraps of rare-earth-containing magnets in Ames, Iowa. Across the West, early miners digging for gold, silver and copper had no idea that one day something even more valuable would be hidden in the piles of dirt and rocks they tossed aside. Now there's a rush in the U.S. to find key components of cellphones, televisions, weapons systems, wind turbines, MRI machines and the regenerative brakes in hybrid cars, a group of versatile minerals on the periodic table called rare earth elements and old mining tailings piles just might be the answer. (AP Photo/U.S.

Department of Energy Ames Laboratory)

(AP)—Across the U.S. West, early miners digging for gold, silver and copper had no idea that one day something else very valuable would be buried in the piles of dirt and rocks they tossed aside.

There's a rush in the U.S. to find key components of cellphones, televisions, weapons systems, wind turbines, MRI machines and the regenerative brakes in hybrid cars, and old mine tailings piles just might be the answer. They may contain a group of versatile minerals the periodic table called rare earth elements.

"Uncle Sam could be sitting on a gold mine," said Larry Meinert, director of the mineral resource program for the U.S. Geological Survey in Reston, Virginia.

The USGS and Department of Energy are on a nationwide scramble for deposits of the elements that make magnets lighter, bring balanced hues to fluorescent lighting and color to the touch screens of smartphones in order to break the Chinese stranglehold on those supplies.

They were surprised to find that the critical elements could be in plain sight in piles of rubble otherwise considered eyesores and toxic waste. One era's junk could turn out to be this era's treasure.

"Those were almost never analyzed for anything other than what they were mining for," Meinert said. "If they turn out to be valuable that is a win-win on several fronts—getting us off our dependence on China and having a resource we didn't know about."

The 15 rare earth elements were discovered long after the gold rush

began to wane, but demand for them only took off over the past 10 years as electronics became smaller and more sophisticated. They begin with number 57 Lanthanum and end with 71 Lutetium, a group of metallic chemical elements that are not rare as much as they are just difficult to mine because they occur in tiny amounts and are often stuck to each other.

Unlike metals higher up on the table such as silver and gold, there's no good agent for dissolving elements so closely linked in atomic structure without destroying the target. It makes mining for them tedious and expensive.

"The reason they haven't been explored for in the U.S. was because as long as China was prepared to export enough rare earths to fill the demand, everything was fine—like with the oil cartels. When China began to use them as a political tool, people began to see the vulnerability to the U.S. economy to having one source of rare earth elements," said Ian Ridley, director of the USGS Central Mineral and Environmental Resources Science Center in Colorado.

Two years ago, China raised prices—in the case of Neodymium, used to make Prius electric motors stronger and lighter, from \$15 a kilogram in 2009 to \$500 in 2011, while Dysprosium oxide used in lasers and halide lamps went from \$114 a kilogram in 2010 to \$2,830 in 2011. There's also the time China cut off supplies to Japan, maker of the Prius, in a dispute over international fishing territory.



In this 1905 photo provided by the U.S. Geological Survey is a channel in bedrock worn by tailings of the Cherokee hydraulic mine in Butte County, Calif. Across the West, early miners digging for gold, silver and copper had no idea that one day something even more valuable would be hidden in the piles of dirt and rocks they tossed aside. Now there's a rush in the U.S. to find key components of cellphones, televisions, weapons systems, wind turbines, MRI machines and the regenerative brakes in hybrid cars, a group of versatile minerals on the periodic table called rare earth elements and old mining tailings piles just might be the answer. (AP Photo/U.S. Geological Survey)

That's when the U.S. government went into emergency mode and sent geologists to hunt for new domestic sources.

"What we have is a clash of supply and demand. It's a global problem. A

growing middle class around the world means more and more people want things like cellphones," said Alex King, director of the Critical Materials Institute of the Department of Energy's Ames Research Lab in Iowa. "Our job is to solve the problem any way we can."

At the University of Nevada-Reno and Colorado School of Mines, USGS scientists used lasers to examine extensive samples of rocks and ore collected across the West during the gold rush days by geologists from Stanford University and Cal Tech.

"If we could recycle some of this waste and get something out of it that was waste years ago that isn't waste today, that certainly is a goal," said Alan Koenig, the USGS scientist in charge of the tailings project.

One sample collected in 1870 from an area near Sparks, Nevada, where miners had searched for a viable copper vein, has shown promise and has given researchers clues in the search for more. They have found that some rare earths exist with minerals they had not previously known occur together.

"The copper mine never went into production, but now after all of this time we've analyzed it and it came back high with Indium, which is used in photovoltaic panels. It never economically produced copper, but it gives us insight into some associations we didn't previously recognize," Koenig said.

Indium also has been found in the defunct copper mine that dominates the artsy southern Arizona town of Bisbee.

Koenig and his colleagues are working to understand the composition of all of the nation's major deposits sampled over the past 150 years. In some cases, the mines were depleted of gold or copper, but the rocks left piled alongside mines and pits could hold a modern mother lode.

"We're revisiting history," he said.



In this undated photo provided by the U.S. Geological Survey is a rock sample being analyzed in a Denver laboratory consisting of quartz, fine grain (microscopic) pyrite, galena and sphalerite. The USGS Mineral Resources program is looking at samples from previously mined ore that may contain critical minerals including rare earth elements. Across the West, early miners digging for gold, silver and copper had no idea that one day something even more valuable would be hidden in the piles of dirt and rocks they tossed aside. Now there's a rush in the U.S. to find key components of cellphones, televisions, weapons systems, wind turbines, MRI machines and the regenerative brakes in hybrid cars, a group of versatile minerals on the periodic table called rare earth elements and old mining tailings piles just might be the answer. (AP Photo/U.S. Geological Survey)

They are compiling data from 2,500 samples to better understand whether it's possible to predict where rare earths might be hiding based



on the presence of other elements there, too.

"If I had to venture a number, I'd say we have found several dozen new locations that are elevated in one or more critical metals," Koenig said. "With this project the goal would be to have this large data base available that would allow us to predict and to form new associations."

Currently there is only one U.S. mine producing rare earths— at Mountain Pass in the Southern California desert. Molycorp Inc.'s goal in reopening the defunct mine is 20,000 metric tons of rare earth elements by this summer, including cerium oxide used to polish telescope lenses and other glass.

The USGS is counting on companies like Molycorp to use the information they've gleaned to uncover other easy-to-reach deposits sitting on federal land and elsewhere.



In this 1905 photo provided by the U.S. Geological Survey are tailings from

hydraulic mines on Spring Creek in Nevada County, Calif. Across the West, early miners digging for gold, silver and copper had no idea that one day something even more valuable would be hidden in the piles of dirt and rocks they tossed aside. Now there's a rush in the U.S. to find key components of cellphones, televisions, weapons systems, wind turbines, MRI machines and the regenerative brakes in hybrid cars, a group of versatile minerals on the periodic table called rare earth elements and old mining tailings piles just might be the answer. (AP Photo/U.S. Geological Survey)

"Without rare earths we'd be back to having black-and-white cellphones again," said the USGS's Ridley.



In this undated photo released by the U.S. Department of Agriculture are rare-earth oxides, clockwise from top center: praseodymium, cerium, lanthanum, neodymium, samarium, and gadolinium. Across the West, early miners digging



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