Critical Battery Mineral Resources in the United States: Past, Present and Potential

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Critical mineral commodities essential for current electric vehicle battery technologies (graphite, cobalt, nickel, lithium, manganese, vanadium) were mined in the U.S. intermittently up to the mid-20th century, yet by the early 2000s, except for one lithium deposit, domestic production had ended. No natural graphite has been mined in the U.S. since the 1950s, and manganese mining ceased in 1970. Vanadium production from Colorado Plateau uraniferous sandstones last occurred in 2020. More recently, however, two brine projects produced lithium in 2022, and nickel and cobalt are currently produced at the Eagle mine in Michigan and from historical mine tailings. In addition to about 100 recently active exploration projects for these commodities, there are more than 100 sites in the U.S. with reported past production or identified resources. To guide new data acquisition for domestic critical mineral resources, the USGS Earth Mapping Resources Initiative (Earth MRI) used a mineral system and deposit type approach to identify more than 800 broad focus areas across the country. Of those, 66 focus areas are known to host critical battery mineral commodities. Areas most likely to provide near-term domestic resources for cobalt and nickel include mafic magmatic systems such as the Duluth Complex, the Tamarack deposit, and the Stillwater Complex; IOCG systems in the Idaho cobalt belt; and potentially, low-grade nickel-cobalt laterite deposits in California and Oregon. Projects are actively evaluating lithium in brines and clays in the Great Basin and Li-Cs-Ta-type pegmatites in the eastern U.S.; graphite in Alaska, Alabama, and Montana; manganese deposits in Maine, Minnesota, and Arizona; and vanadium from black shales and phosphorites in marine chemocline systems and sandstone-hosted uranium deposits. Acquisition of new geologic, geochemical, and geophysical surveys of key areas through Earth MRI provides data required to re-evaluate areas explored in the past and identify new exploration targets.