Why REE?

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The dramatic increase in exploration for rare-earth elements (REE), since 2008, reflects the interplay of several factors that have coalesced to cause robust commodity price increases. The growing demand for these elements in high-technology applications plays a role, in conjunction with supply restrictions imposed by China, which currently supplies >95% of global REE production.

The REE include the lanthanide elements (La to Lu) and the geochemically similar elements Y and Sc. Aside from one member (Europium) the REE behave as a coherent group in most geological processes, which lends them great importance in fingerprinting rocks and tracing their origins. The REE also possess unusual catalytic, optical, diamagnetic and electrical properties, which lend them growing commercial importance. Modern usage of REE is amazingly diverse, but the largest markets by value are in high-strength magnets (e.g., computers and wind turbines), phosphors (e.g., flat-screen TVs) and specialized alloys. In general, the less abundant heavy REE (Gd to Lu) command higher prices than the light REE (La to Sm), although the prices for light REE are currently elevated compared to historical levels. In exploration, assay results for REE are commonly reported as total REE oxides (TREO, including Y), but the balance of the individual elements influences potential value, and should be examined closely in assessing such data.

The most important and largest primary REE deposits are

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associated with carbonatites and peralkaline igneous rocks, and are generated by a combination of igneous and hydrothermal-metasomatic processes. Virtually all primary REE deposits are dominated by light REE, and those hosted by carbonatites typically show marked heavy-REE depletion. Some (but not all) deposits in peralkaline rocks are relatively enriched in heavy REE. Relatively small vein-style REE deposits are also known, and some of these may be very high in grade. Their origins are unclear, but a distal connection to carbonatites is postulated for some. The REE also form paleoplacer deposits, and are potential by-products from large iron-oxide-copper-gold deposits such as Olympic Dam. Secondary REE deposits include monazite-rich beach and fluvial placers, and residual (lateritic) placers that are generally derived by deep weathering of primary carbonatites. "Ion-adsorption clays" are residual deposits developed by weathering of enriched granites, and are important sources for Chinese heavy REE production. There is currently great interest in finding and developing REE deposits outside China, with most emphasis on those that are enriched in heavy REE. There are presently several advanced exploration projects of this type across Canada and North America.