# Geochemistry and mineralogy of rare earth processing

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The geochemistry and mineralogy of REE deposits is diverse, from carbonatite-related deposits, alkaline rocks, mineral sands and ion adsorption clays to potential by-products of phosphate and bauxite, and re-use of waste materials. Despite the large number of prospects that have been explored recently, very little additional REE production has started. A major challenge is to design effective, cost-efficient and environmentally-friendly processing and extraction. Processing flow sheets have to be constructed carefully for each deposit. Translating geochemistry and mineralogy studies, including quantitative mineralogy results, into processing characteristics can be illustrated using results from the Songwe Hill carbonatite, Malawi. Combining results with other published data then allows us to make some general conclusions about the common REE ore minerals and their geological environment, including the REE fluorcarbonate series, monazite and xenotime. The use of chemicals for REE extraction is often the largest environmental burden to mitigate. A new issue is that certain REE, such as Ce, are in oversupply, and are not being recovered in some proposed processing flowsheets. It will be important to understand the environmental and commercial implications of this development.

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