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Targeting heavy rare earth elements in carbonatite complexes

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The world's main sources of the rare earth elements (REE) are concentrated in carbonatite complexes. These have the advantages of high grade and tonnage, combined with low thorium contents, yet they are generally enriched in light rare earths (LREE). The heavy rare earths (HREE, which include Eu-Lu and Y) are more highly sought after because of their role in new and green technologies. HREE are predominantly extracted from ion-adsorption clays in China. These are small, low grade deposits, which are often illegally mined by artisans. Increased government control, environmental legislation and local demand for REE in China have led to high prices and global concerns about the security of supply of the HREE.

Alternative sources of the HREE are poorly documented. We present a review of such targets, including: (1) 'abnormal' carbonatites; (2) areas around LREE-rich complexes such as breccia, fenite and latter stage veins; and (3) weathered carbonatites.

1. At Lofdal, Namibia, carbonatite dykes contain xenotime-(Y) together with LREE minerals. The original chemistry of the carbonatite magma, coupled with late-stage magma and fluid evolution, seem to be controlling factors [1, 2]. The Khibina carbonatite, Kola Peninsula, Russia, is an example of where early LREE carbonatites become increasing HREE-enriched as magmas evolve to carbo-hydrothermal fluids [3].

2. Around carbonatite complexes in Malawi HREE enrichment can be found in breccia and in fenite. Breccia around Songwe shows areas with high Y/La ratios within the matrix caused by narrow zones of xenotime enrichment. Fenite around Kangankunde and Chilwa Island has higher HREE:LREE ratios than the carbonatite [4].

3. At weathered complexes, such as at Mount Weld in Western Australia, changes in both HREE concentration and LREE:HREE ratios are observed. In currently unworked sections of the deposit, the HREE mineral churchite ($YPO_4.H_2O$) has formed concentrations due to groundwater flow [5].

These areas of enrichment are reviewed in terms of their grade, tonnage, rock type and the potential environmental impacts associated with their exploitation.

[1] Wall et al. (2008), *Can Mineral*, **46**, 861. [2] Do Cabo et al. (2011), *Minmag*, **75** (3), 770. [3] Zaitsev et al. (1998), *Minmag*, **62** (2), 225. [4] Dowman et al. (2011), abstract, *Fermor conference*, London. [5] Lottermoser (1990), *Lithos*, **24**, 151