

## **Under-studied carbonatites and REE deposits: The Example of Mongolia**

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Carbonatites are rare igneous rocks, critically important because of their associated rare-metal mineralization. Although carbonatites have been the subject of scientific research and scrutiny for almost a century, many aspects of their origin and evolution, as well as their exploration remain under-studied, controversial or even a hitherto unrecognized.

The exact causes and mechanisms responsible for the uniquely high levels of REE in carbonatites relative to any other igneous rock remain debated. Particularly a few carbonatites in Mongolia are not only more enriched in REE than igneous rocks but are exclusively composed of primary REE carbonates and Ca-REE fluorocarbonates and belong to the most REE enriched carbonatites in the world.

To investigate these mechanisms, a suite of REE-bearing carbonatites from Mongolia (Lugiin Gol and Omnot Olgii) was re-examined. These rocks were repeatedly a subject to series of later (tectonic) processes affecting in different degree original textures, mineralogy and the distribution of REE and other rare metals in the parental rock and their amenability to economic recovery. However, these rocks still contain primary Ba-Sr-REE carbonate burbankite (euhedral hexagonal crystals up to 2 cm × 3 cm in size, either fresh or pseudomorphed by an assemblage of plethora late-stage fluorocarbonates).

These carbonatites are typified by locally extremely high LREE, Sr and Ba contents and depletion in Nb, Ta, Zr, Hf and Ti. These geochemical characteristics are typical of carbonatites emplaced in orogenic settings and derived from mantle sources modified by subduction. However, further isotopic studies are required to constrain the nature of this source and elucidate the relations between the two rock types.