

Geochemistry of carbonatites in Lizhuang REE Deposit, Sichuan, China

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The Lizhuang REE deposit, located about 49 km to the south-west of the Mianning County, Sichuan Province, is a carbonatite vein-type deposit hosted in alkalic complex rocks. In the area are primarily distributed the Middle Devonian silt-clastic rocks, carbonate and the Quaternary proluvium and talus. Magmatic rocks are distributed extensively in this area, including Yanshanian granites, and Himalayan syenites.

In order to elucidate the relationship between the carbonatites and mantle processes, systematic studies on REE geochemistry and C, O, Sr, and Pb isotopes have been carried out.

The Σ REE contents of carbonatites range from 8393×10^{-6} to 53449×10^{-6} , with smooth right-dipping distribution patterns that are similar to those of the well-established deep-sourced carbonatite (Harmer et al., 1998). The C and O isotopic compositions of the calcite samples from the carbonatite stocks in the Lizhuang REE deposit are a very limited range, with the $\delta^{13}\text{C}_{\text{V-PDB}}$ and $\delta^{18}\text{O}_{\text{V-SMOW}}$ values in the range of $-3.9\text{‰} \sim -5.3\text{‰}$, and $8.7\text{‰} \sim 11.9\text{‰}$, respectively. They are fallen into the range of the "primary igneous carbonatites". The Sr and Pb isotopic compositions of the calcite samples from the carbonatite in the Lizhuang REE deposit are relatively constant, with the $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, $^{208}\text{Pb}/^{204}\text{Pb}$ and $87\text{Sr}/^{86}\text{Sr}$ values in the range of 18.1965 \sim 18.2201, 15.6014 \sim 15.6038, 38.4013 \sim 38.4342, 0.706305 \sim 0.706997, respectively. The similarity of Sr and Pb isotopic compositions of the carbonatite with those of EM1 suggests an enriched mantle source for the rare earth elements mineralization and a dynamic process involving mantle materials and tectonics. All of these data suggest that the rocks were derived from the metasomatic enriched mantle.

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