Diversity of carbonatite-related rare earth element deposits: insights from the Mianning–Dechang belt

LIU YAN[1] JIA YUHENG[2]

[1] Institute of Geology, Chinese Academy of Geological Sciences. Beijing, 100037, P. R. China ly_0620@126.com

2 Institute of Geology, Chinese Academy of Geological Sciences. Beijing, 100037, P. R. China vivianlyu@163.com

Carbonatite-related REE deposits have different ore types, scales, ore-formation structures, and evolutionary processes. However, the causes of these variations have not been well studied, which prevents us from understanding the formation of such deposits. The Cenozoic Mianning–Dechang (MD) REE belt in eastern Tibet contains several medium- and large-scale carbonatite-related REE deposits, including brecciated, weathered, and disseminated ores, providing an ideal opportunity to investigate these factors. Geological mapping, petrographic, and geochemical studies show that the deposits in the MD belt have similar formation stages, crystallization sequences, sources, and REE mineralization conditions. Previous studies have shown that the REE mineralization occurred alongside the formation of large-scale overprinted gangue minerals, such as barite, fluorite, and calcite during the lowest-temperature hydrothermal stage (<350 °C), and the REE ores all formed within limited ranges of temperature (247–442 °C) and pressure (700–1056 bar). This implies that all the REE minerals formed under the same conditions, that this mineral assemblage (barite + fluorite + calcite + bastnäsite) has higher ore grades (<13%), and that F^{-}, SO^{2-}, and CO_2 are important for transporting and precipitating REE. Detailed geological mapping suggests that the variation in ore type was caused by local ore-controlling structures, rather than being due to different depths of formation. Sr-Nd-Pb isotopic values of carbonatite-syenite complex and gangue minerals along the whole belt, implying that all the deposits have the same source and the REE were sourced directly from a mixture of crustal and mantle material.

Keywords: Mianning-Dechang, diversity, carbonatite-related REE deposits

References:

Hou, Z.Q., Liu, Y., Tian, S.H., Yang, Z.M., Xie, Y.L., 2015. Formation of carbonatite-related giant rare-earth-element deposits by the recycling of marine sediments. Scientific Reports, 5, 10231.

Liu Y, Hou Z.Q. 2017. A synthesis of mineralization styles with an integrated genetic model of carbonatite-syenite-hosted REE deposits in the Cenozoic Mianning-Dechang REE metallogenic belt, the eastern Tibetan Plateau, southwestern China. Journal of Asian Earth Sciences, 137, 35-79.