

# **Bastnäsite U(Th)-Pb geochronology constrains on the duration of alkaline-carbonatite REE deposit**

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The duration of magmatic-hydrothermal deposit is a hot issue. Alkaline-carbonatite REE deposit, a typical magmatic-hydrothermal deposit, provides > 60% of the global REE resources. Generally, the formation of alkaline-carbonatite REE deposit is related to a protracted evolution of mantle-derived alkaline magma. However, there has been a lack of valid and convincing geochronological evidence for this protracted evolution.

Bastnäsite (CeCO<sub>3</sub>F), is the most important REE mineral in alkaline-carbonatite REE deposit. It not only contains abundant REE, but also has high U and Th contents, is a promising tool for U(Th)-Pb geochronology. Generally, bastnäsite is thought to be of hydrothermal origin, but it can also form in magmatic environment. Therefore, the U(Th)-Pb geochronology of bastnäsite can effectively constrain the duration of magmatic-hydrothermal system of alkaline-carbonatite REE deposit, and is an ideal "probe" for the study of ore-forming process.

The Maoniuping giant REE deposit, located in the western margin of Yangtze Craton, is a typical alkaline (syenite)-carbonatite REE deposit with bastnäsite as its dominant REE mineral. Four types of bastnäsite in the Maoniuping deposit were identified, namely magmatic bastnäsite (Type-A) in syenite, hydrothermal bastnäsite hosted in aegirine-augite barite pegmatite (Type-B), veinlet in syenite (Type-C), and carbonatite (Type-D). In-situ LA-ICPMS U-Pb dating of Type-A, B, C, D bastnäsite shows that the lower intercept age is 28.2±0.5 Ma (n=95, MSWD=5.0), 27.8±0.4 Ma (n=43, MSWD=0.7), 26.8±0.7 Ma (n=50, MSWD=0.8) and 25.8±0.7 Ma (n=55, MSWD=1.7), respectively, consistent with the bastnäsite Th-Pb dating results. The robust and distinguishable age data indicate that the magmatic-hydrothermal system of the Maoniuping deposit lasted for about 2 million years. The above results demonstrate that the U(Th)-Pb geochronology of bastnäsite is a sensitive "timer" for the duration of alkaline-carbonatite REE deposit.