Enriched mantle source and petrogenesis of the Himalayan collision zone carbonatites in Western Sichuan, SW China: lithium isotopic constraints

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The Cenozoic carbonatites in western Sichuan occur in the eastern Indo-Asian collision zone, and occur as sills or dykes in the contemporaneous syenitic intrusions, which form a 270-km long, NS-trending belt of carbonatite-alkali complexes, controlled by strike-slip faults that accommodated and adjusted to the collision strain. The WSC are characterized by low SiO_2, FeO and MgO, and a wide range of CaO content that distinguish them from primary magnesiocarbonatites. Overlapping emplacement ages, Sr-Nd isotopic compositions and mantle-normalized trace element patterns, which are similar to those of the associated syenites, suggest that the carbonatites formed as a result of liquid immiscibility.

Most samples of carbonatites and syenites contain 1.1 and 1925.5 ppm Li and have δ^7Li values of +0.2 and +5.8. These Li isotope compositions overlap with those reported for MORB and OIB, suggesting that the carbonatites and syenites reflect the Li isotopic composition of their mantle source. However, three samples of carbonatites contain 0.8 and 86.7 ppm Li and have higher δ^7Li values of +8.7 and +10.8, which suggest that Li in the carbonatites was incorporated from an altered oceanic crust. Nine samples of carbonatites contain 14.0 and 359.9 ppm Li and have lighter δ^7Li values of -4.5 and -0.4, which may reflect assimilation of isotopically light lower crustal mafic granulites. Therefore, the formation of these carbonatites and syenites probably was related to recycling of oceanic crust and sediments, different from those carbonatites generated by anorogenic processes (e.g. rifting) may derive from primitive or depleted mantle sources, which have not been influenced by crustal recycling.

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