

## Petrogenesis of the sodic lamprophyres from the Permian Tarim Large Igneous Province: subduction-related source enrichment

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The mineralogy and composition of the source region for the sodic lamprophyres remains poorly constrained. Here we provide the first description of the recently recognized sodic lamprophyre dikes (onidite, kersantite and spessartite) in the northwest margin of the Permian Tarim igneous province (TLIP), NW China. These dikes display porphyritic texture with phenocrysts of olivine, clinopyroxene, hornblende and biotite. The groundmass is mainly composed of microcrystallites of clinopyroxene, hornblende, biotite, pyrite, titanium-magnetite and albite with minor apatite. Most of them are enriched in Fe, belonging to sodic ferrolamprophyre. They exhibit limited  $\delta^{66}\text{Zn}$  values of 0.22 to 0.46 ‰, heavier than that of normal mantle (0.28 ‰ ± 0.05). Combined with carbonate globules in the rocks, the heavy Zn isotopes indicate the involvement of recycled carbonates in the mantle source. In contrast, their  $(^{87}\text{Sr}/^{86}\text{Sr})_{\text{t}}$  (0.7036 to 0.7061),  $\varepsilon\text{Nd(t)}$  (-0.88 to +5.67) and  $\delta^{26}\text{Mg}$  (-0.36 to -0.17 ‰) values are consistent with a normal mantle origin. The decoupling between Mg and Zn isotopes suggests not only the involvement of recycled carbonates which underwent phase transformation (calcite/dolomite to magnesite) in the convergent margin, but also the role of fluids released from subducted slab in the mantle source which interacted with the lithosphere mantle to produce amphibole-bearing peridotite. The results from our study suggest that the parental magma of the Wajilitag lamprophyre was derived from a mixed mantle source, composed of two endmembers: (1) metasomatized amphibole-bearing lithospheric mantle source; (2) carbonated eclogite-bearing plume source. The heterogeneity of the source resulted through interaction between the subducted plate, mantle plume, and lithosphere mantle.