

Origin of coeval Cenozoic shoshonitic and calc-alkaline rocks in the Yunnan Tethyan belt and composition of the lithospheric mantle beneath SE Tibet

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Post-collisional potassic and calc-alkaline rocks offer crucial insight into subduction process, mantle composition, and geodynamics. In the Zhuopan alkaline complex of the Tethyan orogenic belt, western Yunnan, coeval shoshonitic and calc-alkaline rocks (~36 Ma) were identified. Shoshonitic rocks are characterized by high K₂O contents with K₂O/Na₂O ratios >2, while calc-alkaline rocks have lower K₂O contents with K₂O/Na₂O ratios <2, suggesting different magmatic processes and/or distinct sources. Both rock types are enriched in large ion lithophile elements, depleted in high field strength elements, and enriched Sr-Nd isotopic signatures, implying derivation from an enriched mantle modified by subducted material. Shoshonitic rocks display more depleted Sr-Nd isotopic characteristics compared to calc-alkaline rocks. Both rock types exhibit lower $\delta^{26}\text{Mg}$ values than normal mantle, with calc-alkaline rocks having slightly more negative values. Furthermore, clinopyroxenes in calc-alkaline rocks have higher Mg[#] values and CaO/Al₂O₃ ratios, indicating intense carbonate melt metasomatism in the mantle wedge. The shoshonitic rocks, with high Rb/Sr ratios and elevated Al₂O₃, K₂O, and TiO₂ contents, imply that they are products of low-degree partial melting of phlogopite-bearing mantle. In contrast, the calc-alkaline rocks, characterized by high Ba/Rb and Zr/Nb ratios and low normative leucite + nepheline contents, formed from high-degree melting of amphibole-bearing mantle with considerable involvement of mantle peridotite. The compositional architecture of the lithospheric mantle beneath SE Tibet may signify metasomatic fingerprints in the upper mantle, with specific emphasis on amphibole- and phlogopite-bearing vein systems. We propose that the reactivation of the Ailaoshan-Red River shear zone, triggered by Indo-Eurasian collision, induced regional decompression in the lithospheric mantle and upwelling of the asthenospheric, responsible for the formation of Cenozoic mantle-derived rocks along the SE margin of the Tibetan Plateau.