

Transition metal geochemistry of Hawaiian magmas

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Hawaiian shield lavas are too siliceous to be in equilibrium with garnet peridotite. It has been proposed that dacitic melts from eclogite mix with picritic melts from garnet peridotite to yield high-SiO₂ lavas [1, 2]. Alternatively, Sobolev *et al.* [3, 4] proposed a two-stage model in which partial melts from eclogite initially react with peridotite, and form a secondary garnet pyroxenite (SGP). They proposed to explain the high SiO₂ content (and high Ni content in olivine) observed in Hawaiian shield lavas by addition of varying amounts of partial melts from SGP to picritic magma.

We precisely analyzed first-row transition metals in Ko'olau and Kilauea lavas by ICP-MS. Here, we use Sc and Mn abundances to test the two proposed models. Both Sc and Mn are moderately incompatible during partial melting of garnet peridotite, but strongly compatible during partial melting of eclogite or SGP. Our calculations indicate an upper limit of 20ppm Sc in SGP, assuming [Sc]=25ppm in peridotite and 50ppm in eclogite. Since Sc is compatible during partial melting of SGP, the resulting partial melts have [Sc] too low to account for even the lowest [Sc]₁₅ (abundance at MgO=15%), 19-24ppm in Makapu'u-stage Ko'olau lavas, of any Hawaiian shield lavas. Rather, the lower Sc₁₅ in Makapu'u-stage Ko'olau lavas are consistent with adding up to 30% dacitic magma ([Sc]=8.6ppm) to picritic magma ([Sc]=27ppm). This implies an eclogite:peridotite mass ratio of 1:5 for the source of Makapu'u-stage Ko'olau lavas, significantly less than the eclogite:peridotite mass ratio of 2:1 estimated by Sobolev *et al.* [3, 4].

[1] Hauri (1996) *Nature*. [2] Huang & Frey (2005) *CMP*.
[3] Sobolev *et al.* (2005) *Nature*. [4] Sobolev *et al.* (2007) *Science*.

Petrogenesis and tectonic implications of Neoproterozoic granitoids from northern Kangdian rift, South China

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As a contribution to the current (mantle plume versus arc) debate on the Neoproterozoic tectonic setting of South China, geochronologic and geochemical analyses have been carried out on the large exposed granitoids in the Mianning and Mopanshan areas, northern Kangdian rift of western Yangtze Craton. It is shown by zircon SHRIMP U-Pb dating that both the Mianning batholith and the Mopanshan complex were all emplaced at ca. 780 Ma. The Mianning granites display highly fractionated feature (i.e., SiO₂ > 75 wt %; Eu/Eu* = 0.03 ~ 0.50; enrichment of K, Rb, Th, U, Zr, Hf, Y and REEs; depletion of Nb, Ta, Ba, Sr, P, Eu and Ti). Characterized by metaluminous to strongly peraluminous (A/CNK = 0.93 ~ 1.55) feature, the Mianning granites contain excessive perthites and minor alkali riebeckite and sphene, sharing petrological and geochemical characters of A₂-type granites. This and positive ε_{Nd}(t) (2.97 ~ 5.24) and zircon ε_{Hf}(t) (9.2-12.1) values are consistent with a derivation by partial melting of a relatively young crust formed during latest Mesoproterozoic to early Neoproterozoic (ca. 1.0 ~ 0.9 Ga). The occurrence of Mianning A-type granites is suggestive of an anorogenic, crustal extensional environment for western Yangtze Craton during the Neoproterozoic. The Mopanshan samples display adakitic features (i.e., intermediate SiO₂, elevated Al₂O₃, Na₂O, Sr/Y and low Y (6.06 ~ 16.6 ppm) contents with LREE-enriched and HREE-depleted patterns (Yb_N = 2.2 ~ 5.9)). Their low MgO (0.88 ~ 2.14 wt%), Cr and Ni contents, negative ε_{Nd}(t) values (-2.06 ~ -0.43) and old zircon Hf model ages (1.0 ~ 1.3 Ga) all suggest that partial melting of a thickened lower crust took place at western Yangtze Craton because of crustal extensional environment and thermal anomalies probably aroused by Neoproterozoic mantle plume.

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