Slab melting in central Indian HMA: a mineral perspective

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This study presents whole-rock chemistry and mineral chemistry of a rare clinopyroxene hornblendite (DMC) that are petrogenetically related and temporally and spatially associated with the Pitepani High-Mg andesites (HMA) of ~2.5 the Dongargarh Supergroup, Bastar craton, central India.

The major and trace element chemistry of the clinopyroxenes (cpx) reveal normal, reverse and oscillatory zoning and striking similarity to cpx of the Aleutian HMA and high-pressure experimental cpx of HMA. Primitive melts in equilibrium with mantle-derived cpx reveal garnet signatures (i.e., high La/Yb and Sr/Y ratios, low Y and Yb contents with no negative Eu-anomalies); whereas evolved melts in equilibrium with evolved cpx do not show garnet signatures. Melts in equilibrium with primitive amphibole (amp) are LREE-enriched, lack negative Eu-anomalies as well as garnet signatures, signifying dilution of the garnet signature with fractionation. Cpx are replaced by amp, implying peritectic reaction of cpx + melt = amp. Intensive variables calculated with amp thermobarometry suggests amp formation from a hydrous melt at high-temperature (~950ºC) and high-pressure (~0.75Gpa) and hence crystallisation of cpx at pressures >0.75 Gpa. The whole rock chemistry and the cumulate line of descent (CLD) of the DMC are similar to the Southern Plutonic complex that represents hydrous, high-pressure fractionation in the deep roots of the Kohistan arc. Furthermore, the cumulate (CLD) and modelled liquid line of descent (LLD) follows the experimental fractional crystallization CLD and LLD of hydrous, high-pressure primitive HMA at ~1.0 Gpa.

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