Mantle processes and sulphide saturation history of volcanic rocks in diverse tectonic scenario: Platinum Group Element (PGE) geochemistry of Archean iron ore group and Proterozoic Malangtoli metavolcanic rocks of Singhbhum Craton, eastern India

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The Singhbhum Craton of eastern India preserves records of several episodes of volcanism, plutonism, sedimentation and mineralization spanning from Paleoarchean to Mesoproterozoic in a dynamic tectonic milieu. Major, trace and PGE geochemical data from the ~3.4 Ga Iron Ore Group (IOG) lavas of the Jamda area and ~2.25Ga metavolcanics of Malangtoli are studied. Both the volcanics are porphyritic basalts and exhibit similar mineralogical compositions overprinted by greenschist to lower amphibolite grade of metamorphism. The calc-alkaline basalts of IOG show 26.23-68.35 ppb of ΣPGE, whereas the tholeiitic to calc-alkaline Malangtoli basalts, having both low and high MgO varieties, display relatively higher ΣPGE of 43.01-190.43 ppb. The studied samples have relatively enriched ΣPPGE ranging from 24.1-63.3 ppb (IOG) and 34-227.3 ppb (Malangtoli) against 2.2-4.1 ppb and 1.9-8.9 ppb ΣIPGE contents respectively. HFSE and REE signatures suggest derivation of IOG lavas through <1 to 1% partial melting of garnet lherzolitic mantle, while the Malangtoli basalts were generated by 3-<10% melting in spinel to garnet lherzolite mantle domain. PGE (Pd/Ir, Pd/Pt, Cu/Pd, Ni/Pd, Cu/Ir) ratios corroborate a sulphide saturated, PGE depleted character of IOG and low MgO Malangtoli basalts indicating crustal assimilation of these lavas. However, the high MgO Malangtoli basalts exhibit sulphide undersaturated, PGE undepleted nature with no evidence of crustal contamination. The IOG lavas correspond to intraoceanic arc setting with polygenetic crustal signatures. The Malangtoli basalts are affiliated to transitional arc to rift-controlled back arc in a basinal environment that developed proximal to an active convergent margin.