Geochemistry and genesis of manganiferrous BIF in the southern part of Kunigal schist belt, Dharwar craton, India

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The N-S trending, slightly curvilinear Kunigal schist belt in the southern part of Dharwar craton in southern India is largely an ensemble of BIFs and metabasalts. The belt extends for 30 km with an average width of 2 km. Gneissic rocks surround this belt. Imprints of greenschist to upper amphibolite facies metamorphism are pervasive in the belt. Ridges of BIFs occur as narrow linear bodies trending along N-S to N20°E, with steep dips. Mineralogically, they consist of magnetite, quartz, hematite, grunerite, cummingtonite, almandine rich garnet and manganese oxides.

The iron oxide content as Fe_2O_3 (wt %) ranges from 16.13 to 32.96; SiO_2 from 42.56 to 72.41 and Al_2O_3 0.59 to 2.45. All the samples show depletion in TiO_2(0.02-0.31), Al_2O_3(0.59-2.45), CaO(0.87-2.1), MgO(0.24-1.12), Na_2O(0.28-0.62) and K_2O (0.07-0.16) indicating the possible absence of terrigenous source for Fe and Mn rich sediments. Ba, Zn and Cr show higher concentration but Sr, Pb, Rb, Ni, Co and V are present in lower concentration. LREE contents range from 7.65-24.03 and HREE 1.77-10.58. Chondrite-normalized REE patterns show +ve Eu anomaly whereas Ce shows -ve anomaly. These anomalies, besides enrichment of LREE, suggest the oxic environment of their (BIFs) formation. The $Fe^{3+}/(Fe^{3+}+Fe^{2+})$ ratio (0.78 to 0.97) further indicates high degree of oxidation.

Major, trace and REE study indicates that BIFs were derived from hydrothermal/fumarolic activity. SiO_2 versus Al_2O_3, Ni-Zn-Co and Fe-(Ni+Cu+Co)-Mn discrimination diagrams and chondrite normlised La/Nd and Dy/Nb ratios also support the view that BIFs were formed as submarine, hydrothermally derived sediments. It is deciphered that Fe and Mn were fractionated on precipitation, producing high Mn/Fe ratios.