Platinum Group Elements and Mineral Chemistry of Cumulates and Mantle Rocks of Manipur Ophiolites, Indo-Myanmar Orogenic Belt, NE India: Mineralization and Tectonic Implications

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Evolution of the Indo-Myanmar Orogenic Belt (IMOB) has been interpreted as an accretion prism resulting from the convergence between the Indian plate and Myanmar plate and accreted just prior to the mid-Eocene. The Naga-Manipur Ophiolite Belt (NMOB) forms a part of the NNE-SSW trending IMOB and the Manipur Ophiolite Complex (MOC) is the southern extension of this belt which consists of dismembered peridotites, gabbro, dolerite, basalt, pelagic sediments and podiform chromitites

The Cr-spinel in peridotites of MOC characterized by low Cr_2O_3 (10.03-23.37 wt.%) and high Al_2O_3 (43.77–55.86 wt.%), FeO (11.45–12.45 wt.%) and MgO (16.98–18.41 wt.%). The Cr # and Al # has spacious ranges of 18.00 to 26.36 and 74.26-88.36 respectively. High Mg # (70.58-73.43) in the samples reflects the subsolidus exchange of Fe-Mg between Cr-spinel and surrounding silicate minerals. Their chemistry is comparable to those of observed in Cr-spinel of alpine and abyssal peridotites (Dick and Bullen, 1984, Arai, 1992). The Al_2O_3-TiO_2 and Al_2O_3-Fe^{+2}/Fe^{+3} variations in Cr-spinel in comparison with respect to modern-day tectonic settings depict the host peridotites is of mid oceanic ridge type. Chromitites has higher concentrations of IPGE (Os = 25-187 ppb; Ir = 11-72 ppb; Ru = 65-279 ppb) as compared to the PPGE (Rh = 9-17 ppb; Pd = 4-18 ppb; Pt =1-9 ppb). The chondrite-normalized PGE patterns for these chromitites are comparable with typical podifom chromitites in ophiolite with enriched in IPGE and depleted in PPGE (Zhou, et al., 2005; Zaccarini et al., 2008). The negative slope of the PGE pattern in the chromitites from Ru to Pd with PPGE depletion may reflect the low degree of partial melting for the involved magma in the deeper part of the mantle section in the mid-ocean ridge environment (Barnes et al. 1985; Prichard et al. 1996). Basalts show relatively uniform compositions and they have geochemical characteristics (Ti > 1 wt. %; Ti/V = 21-43; La_N/Sm_N = 0.62-0.90; low Ce/Y = 0.38-0.82; Ta/Hf = 0.17-0.53 and Th/Yb = 0.02-0.55) that are compatible with those of high-Ti basalts generated at mid oceanic ridge (Beccaluva et al., 1983; Saccani and Photiades, 2004).

Occurrence of high Al Cr-spinels in Abyssal peridotites; existence of high-Ti tholeiitic basalts and characteristics of PGE in chromitites of Manipur Ophiolitic Complex (MOC) of Indo-Myanmar Orogenic Belt (IMOB) provide new constraints for the early oceanic environment of Neo-Tethys Ocean. It is also suggested that the

peridotites might be representing the residue left after extraction of MORB-type basalt from the source, followed by the crystallization of high-Al Cr-spinel at low degree partial melting.

References

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