Platinum group element signatures in a Proterozoic subduction zone - Implications on the petrogenesis of gabbroic rocks of Prakasam Igneous Province, Eastern continental margin of India.

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The Prakasam Igneous Province is located in a narrow tract having Eastern Ghat Mobile belt on the east and the intra-cratonic Proterozoic Cuddapah basin to the west. The region has experienced bimodal igneous activity which has resulted in the emplacement of several mafic and alkaline rock complexes closely spaced along the linear belt with sharp contact relationships having attributed to major thermotectonic event(s).

The rock associations of majority of plutons are gabbroic to dioritic having silica undersaturated to saturated in composition. Petrological studies (Fig.1) reveal that the grain size is coarse to medium with very well defined grain boundaries. Cumulus, hypidiomorphic holohayaline and subophitic textures are found in all the gabrroic rocks with mineral assemblages of plagioclase feldspar, cpx , opx, biotite, hornblende, sphene and occasional olivine. TAS diagram classifies these rocks as subalkalic–tholeiitic gabbros.

Relative enrichment of LILE as Sr (up to1100 µg/g), Ba (up to 970 µg/g) Rb (up to 490 µg/g) of Ni (up to 963 µg/g), Cr (up to 2330 µg/g) are characteristic features of lower crustal involvement in the magma processes. The REE plots of gabbroic assemblages show well fractionated (La/Lu_N=67.08). Positive, flat and negative Eu anomalies are observed in these rocks pointing towards the cumulus nature of plagioclase in the melt and early fractionation during the crystalisation process. LREE enrichment and HREE depletion is characteristic of subduction zone environment. The mantle normalised data show that the relative enrichment of PPGE group over IPGE group although Pd is slightly depleted (Fig.2).

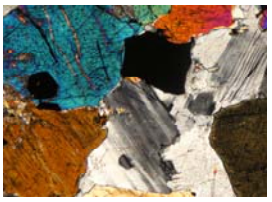

Fig.1

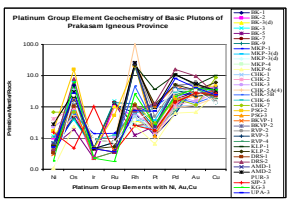

Fig.2

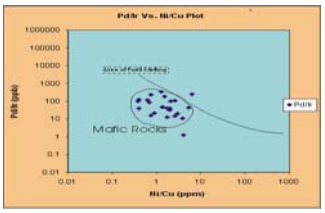

Fig.3

The trace element distribution patterns with positive anomalies of Sr, Ba, Rb, Nb further confirms the low degree of partial melting and fractional crystalisation in

Island arc to subduction environment. The low PGE signatures (∑ PGE 1.89-108.3 ng/g) are characteristic of lower degree of partial melting while the interstitial sulphides were preferentially incorporated into the liquid phase, producing a PPGE rich melt with a moderate Pd/Ir ratios (Alard et al, 2000). Pd/Ir Vs. Ni/Cu discriminates the rocks falling below the line of partial melting (Fig.3). This is in good agreement with the present major, trace and REE data and observations made by earlier workers (Vijaya Kumar et al, 1995) on the melting behaviour of the PIP gabbros.