

METASEDIMENTARY ROCKS FROM THE BASTAR – MALKANGIRI PEGMATITE BELT IN PARTS OF CHHATTISGARH AND ODISHA, INDIA

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Abstract

Meta-Sedimentary Rocks (MSR) and amphibolites host mineralized Rare Metal (RM: Nb-Ta, Be and Li)- and Sn-bearing granite pegmatites and their parental, fertile S-type granites in the Bastar – Malkangiri Pegmatite Belt (BMPB) in SE part of Bastar Craton in parts of Chhattisgarh and Odisha. Field setting, structural aspects, petrography, petro-chemistry and metamorphic aspects of MSR are presented in this paper. MSR, occupying the low-lying area in about half of the region under study and comprising of andalusite-schist, quartz-muscovite schist, sericite-quartzite and quartzite, are the oldest rock formations and belong to the Archaean Bengal Group. They form a major synform with E-W axis, and were intruded by late Archaean amphibolites and Proterozoic granites and pegmatites. Petrographically, andalusite-schist and quartzite are medium- to coarse-grained, with the former containing quartz, biotite, muscovite, sericite and andalusite as major minerals, and feldspar, zircon (rounded), chlorite, epidote, apatite and opaque ore minerals as minor to accessory minerals, whereas the latter comprises of mainly quartz with siliceous matrix and disseminations of black opaque minerals. Quartz-muscovite schist and sericite-quartzite are fine- to medium-grained, with the former showing mineralogical variations from a more micaceous quartz-biotite-muscovite schist through quartz-sericite schist to quartzofeldspathic-schist, with the major minerals quartz, sericite, muscovite and biotite, and accessories of zircon, monazite (rounded) and opaque minerals, and displays deformation phenomena, whereas the latter exhibiting a mosaic texture with quartz as the major mineral and minor to accessory feldspars, sericite, muscovite, biotite, chlorite, epidote and opaque ore minerals. Petro-chemically, andalusite-schist and quartz-muscovite schist are characterized by high Al_2O_3 (17-28 wt. %) and lesser SiO_2 (53-68 wt. %), whereas in sericite-quartzite and quartzite it is vice versa, with all the four rock types having variable K_2O content (1.7 to 5.6 wt. %). Of the trace elements, MSR are generally characterized by high to very high content of Rb (206-1242 $\mu g/g$), Ba (308-1295 $\mu g/g$, except one with 68 $\mu g/g$) and Zr (95-530 $\mu g/g$). Of the two MSR samples analyzed for REE, the andalusite-schist is marked by higher total REE, LREE and HREE, as compared to that of the sericite-quartzite, with both showing similar chondrite-normalized patterns and small negative Eu-anomaly ($Eu/Eu^* = 0.67$ and 0.61). MSR are mainly argillaceous and arenaceous in bulk chemistry, with their provenance rocks being mostly peraluminous, plutonic acidic rocks of granite family, with a minor component of reworked meta-sediments. The mineral assemblage, textures and petro-chemistry of MSR point to their low-grade and low-pressure Abukuma-type metamorphism, with metamorphic conditions of upper greenschist facies to lower cordierite-amphibolite facies at a T of about 400-500°C and P_{H_2O} of 2-4 kb under equilibrium conditions, with a steep geothermal gradient in the area.

Keywords: Meta-Sedimentary Rocks, Petrography, Petro-chemistry, Metamorphism, Bastar-Malkangiri Pegmatite Belt, India.