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Geology and genesis of pegmatite-hosted REE–Y–Nb mineralization in Sausar Mobile Belt, Central India

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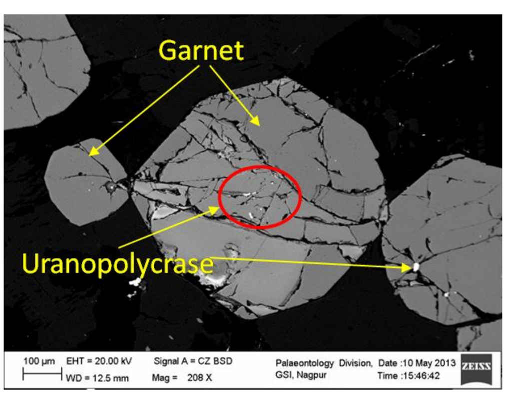
____The increasing global interest in rare earth elements (REE) due to their versatile utility has prompted the geoscientific community to search for new REE occurrences in various geological domains. REEs are indispensible in today's electronic world, used in everything from smart phones to hybrid vehicles to MRI machines to cordless power drills. REE mineralisation is known to occur in diverse geological settings including igneous, sedimentary and metamorphic rocks. However, their exceptional enrichment is known in carbonatites and pegmatites. We are reporting REE mineralisation from pegmatites of the Sausar Mobile Belt (SMB), Central India.

The Proterozoic SMB is located along the southern margin of the Central Indian Tectonic Zone (CITZ), trending between E-W and ENE-WSW, that has undergone multiphase deformation, metamorphism and magmatic activity. The Sausar mobile belt is made up of quartzite-pelite, calcsilicate, quartz-muscovite-biotite schist and marble [1].The Sausar Group rocks have been intruded by late phases of granite, pegmatite and quartz veins. Pegmatite and alkali feldspar granite intrude through the basement comprised of Tirodi Biotite Gneisses (TBG) and Sausar Group of rocks around Parseoni, Nagpur district, Central India. The pegmatite occurs as parallel dykes and veins showing sharp contacts with host TBG. They vary in length from a few cm to more than 500 m and in width from a few cm to 50 m.

The pegmatites are coarse to very coarse grained exhibiting bimodal distribution of grains composed of quartz, plagioclase, K-feldspar, (microcline and perthite), muscovite, tourmaline ± biotite and garnet, zircon, apatite, sphene, beryl and monazite. The effects of sericitisation, kaolinisation and saussuritisation are commonly observed. They show perthite, graphic and myrmekite textures; the development of myrmekite and flame perthite is indicative of strain related to ductile deformation. REE-bearing phases zircon, monazite, apatite, sphene and garnet are present in pegmatite and alkali feldspar granite, embedded within K-feldspar, plagioclase and along crystal boundaries and within fractures. Monazite shows two modes of occurrence viz. primary in association with zircon and xenotime, and secondary as late fracture fillings, replacement and inclusions within garnet. SEM-EDS study of these minerals reveals the presence of LREE as well as HREE. Zircon contains Hf in association with U. Titanomagnetite (vanadium bearing), sphene, apatite and fluor-apatite are present in significant amounts, with LREE present in apatite, fluor-apatite and sphene. REE-bearing minerals present in trace amounts include: Ta-Nb-U-Nd (euxenite-polycrase), Ce-Nd-Gd-Dy-Yb-Y (okanoganite), Ta-Nb-U-Nd (uranopolycrase) and Ce-Nd-Gd-Dy-Yb-Y (hingganite).



Our present data indicates that the pegmatites are moderately to highly evolved and mineralogically distinguishable as simple to complex types. They belong to the NYF REE class (Nb–Y–F), and are interpreted to have formed in a late syn- to post-tectonic setting [2]. The occurrence of these REE-containing minerals indicates a peraluminous melt composition and a volatile-rich fractionated pegmatite magma.

Fig.1 SEM-BSE image showing Euxenite-Polycrase within garnet of Sausar pegmatite.

References:

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[2] Cerny P and Ercit TS (2005) Can. Miner. 43: 2005–26.