Paper Number: 473

Titaniferous lateritic-bauxite (TLB) capping over Sung Valley Pyroxenite: A host for REE mineralisation (?) in Meghalaya, India

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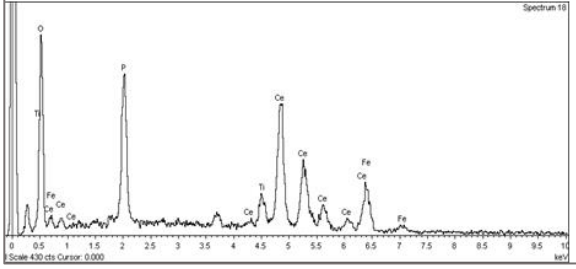
Significant values of REE are found within the Titaniferous lateritic bauxite (TLB) capping developed over alkali pyroxenite of Sung Valley Ultramafic-Alkaline-Carbonatite (SUAC) Complex, Meghalaya, India. The laterite capping is developed around Mawiong and Lumkynthang villages, East Khasi Hills District, Meghalaya, India. It is highly ferruginous with ochre red and pink with patches of chocolate brown/reddish brown colours. The thickness of residual lateritic profile varies from 1 m to 5m.

Mineralogical and geochemical studies have been performed to characterise and assess REE potential in lateritic cappings. These titaniferous, vanadium rich aluminous laterite capping comprise anatase, diaspore, gibbsite, boehmite as major minerals with minor hematite, nacrite, florensite-(Ce), florensite-(La), florensite-(Nd), kobeite-(Y), and goethite. TiO_2, Al_2O_3 and Fe_2O_3(t) concentration varies 14.56-34.01, 11.71-29.82 and 10.12-37.62 (in wt. %) respectively. The other significant trace elements are Cr (166-1089 ppm), Ni (38-599 ppm), Sc (422-747 ppm), Nb (267-1971 ppm), V (644-3329 ppm) and Zr (440-1954 ppm) which is further supported by the Ce, Ti, Fe, and P peaks determined by SEM analysis (Figure 1).

The REE analysis of TLB by ICP-MS indicate significantly enrichment than host rock and total rare earth elements viz. ΣREE (La-Lu) ranging from 2101 to 10340ppm (ΣLREE ranging from 2011 to 10020ppm and ΣHREE ranging from 66 to 319ppm). The distribution pattern, normalised to chondrite exhibits a strong enrichment of light rare earth elements (LREE) with a negative Eu anomaly. Florensite-(Ce), florensite-(La), florensite-(Nd), and kobeite-(Y) are REE minerals identified by the XRD analysis of TBL capping.

Enrichment of REE with increasing TiO_2, P_2O_5, and CaO suggest that titanite, perovskite, and apatite present in the host pyroxenite and presence of anatase in the bauxite may be the reservoir for hosting REE and breakdown of these minerals during weathering and bauxitisation. This new finding has got immense impact on the future REE exploration locales.

Element	Weight%	Atomic%	Compd%	Formula	Number of ions
P K	12.46	14.44	28.55	P2O5	1.78
Ti K	3.51	2.63	5.85	TiO2	0.32
Fe K	9.75	6.27	12.54	FeO	0.77
Ce L	45.30	11.61	53.05	Ce2O3	1.43
O	28.98	65.05			8.00
Totals	100.00				
				Cation sum	4.30



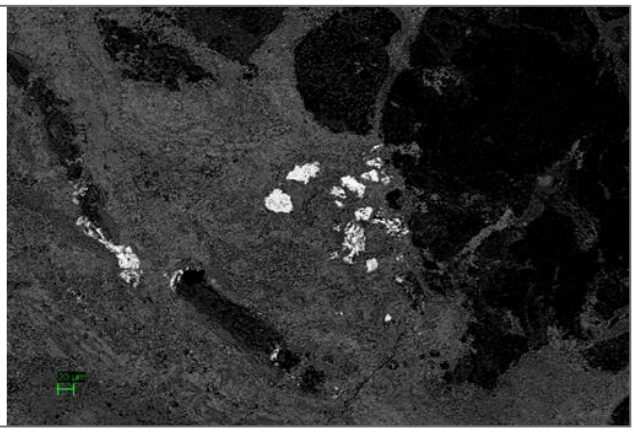


Figure 1: SEM-EDX analysis, spectra, photograph showing Ti bearing REE phosphate mineral in TLB