

Paper Number: 481

## REE enrichment in lateritic soil profiles and its economic potentiality - a case study from Nongpoh Granitoids, Meghalaya, India

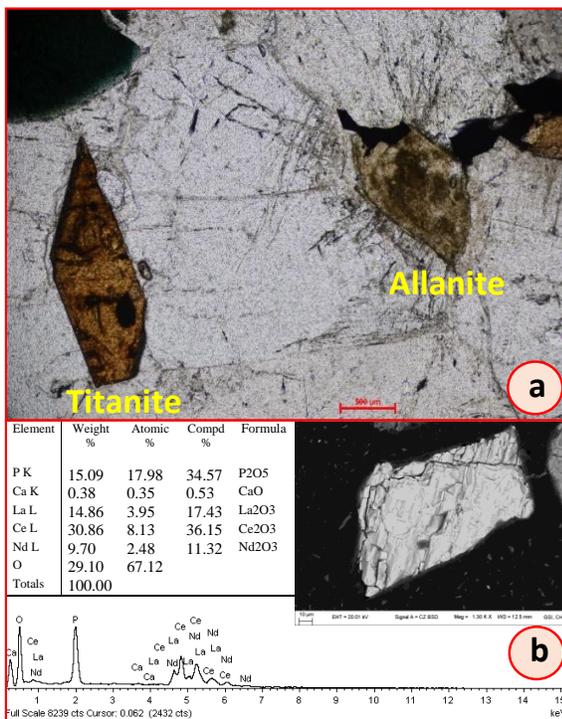
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REE behaves as immobile elements in laterites and tend to be enriched compared to the parent rock. Laterized granitic rocks in China is source of more than 80 percent of the world's economic heavy REE (HREE) [1]. Easy extraction of these ion-adsorption type REE deposits, low cost of mining and processing of REE may open up new vista towards augmentation of the economic potentiality of these strategic elements. The present study aims to find out the potentiality of REE in thick weathered profiles over calc-alkaline Nongpoh granitoids through integrated application of petrological, mineralogical and geochemical studies. The Nongpoh granitoids of Meghalaya Plateau, comprises granite and its variants, covers 300 km<sup>2</sup> area [2]. The well-developed thick lateritic soil profiles over Nongpoh granitoids ranges up to 15m.

Bed rock samples of porphyritic granite shows value for total REE ( $\Sigma$ REE = La to Lu +Y +Sc) ranging from 461 to 1165ppm (average 722ppm). Petrographic studies of granites (Fig. 1a) followed by EPMA analysis revealed that the high REE values are due to the presence of parisite (65.1-70.7% tREO), monazite (55.5-61.2% tREO), allanite (16.3-26.8% tREO), and titanite (1.0-4.1% tREO).

Soil developed over Nongpoh granitoids was classified based on the difference in colour and texture. Soil from different horizons revealed  $\Sigma$ REE value ranging from 463 to 1714ppm (average 863ppm) with enrichment of REE in B- and C- horizons. Soil from B-horizon contains  $\Sigma$ REE value ranging from 623 to 1958ppm (average 1064ppm). Fluocerite-(La), Fluocerite-(Ce), and Seidite-(Ce) are REE minerals identified through XRD analysis in the bulk samples of lateritic soil profiles. SEM-EDX analysis of heavy minerals from lateritic soil indicated significant presence of REE bearing phosphate phases rich in LREE viz. La-, Ce-, Nd- (Fig. 1b) with few Y-, Th. Besides, grains of Ce oxides with iron and manganese oxides were also identified.



The study reported for the first time, significant values of REE and REE bearing minerals in lateritic profiles over Nongpoh granitoids. Substantial enrichment of REE in lateritic soil may be instrumental to unlock many strategic secondary REE avenues, particularly in North East India having favourable climatic conditions for the development of thick lateritic profile. Also, considering the large aerial extent of Nongpoh granitoids and associated lateritic capping, systematic investigation may demarcate zones of higher REE concentrations of considerable economic potentiality.

*Figure 1: (a) Spindle shape titanite and allanite with radial fractures, due to the emission of radioactive particles in parent Nongpoh granite, (b) LREE (Ce-, La-, Nd-) phosphate (monazite) in lateritic soil*

*References:*

- [1] Chi R and Tian J (2008) Nova Science Publishers, New York, 288
- [2] Sadiq M et al. (2014) Curr Sci 47(3): 303-322

