

## **Occurrence and Mobility of REE-Bearing Minerals in A-Type Granites of the Besar Group, Peninsular Malaysia: Potential for REE Deposits**

Siti Zaniza Tohar,<sup>1,\*</sup> Ben J. Williamson,<sup>1</sup> Frances Wall,<sup>1</sup> and Azman A. Ghani<sup>2</sup>

<sup>1</sup>Camborne School of Mines, University of Exeter, Cornwall Campus, TR10 9FE, United Kingdom

<sup>2</sup>Department of Geology, Faculty of Science, University of Malaya, 50603, Kuala Lumpur, Malaysia

\*Corresponding author: e-mail, szbt201@exeter.ac.uk

Mineralogical and geochemical studies have been conducted on fresh and weathered A-type granites sampled at Besar, Tengah, and Hujung islands, southeast Peninsular Malaysia. The aim of the study is to evaluate REE mobility during weathering and the subsequent form and concentrations of REE in soils and saprolites to identify criteria and areas for further exploration. Fresh and weathered granites are highly felsic with SiO<sub>2</sub> from 76.5 to 78.1% (differentiation index = 95.3–97.9) and 74.7 to 80.5% (differentiation index = 96.3–99.4), respectively. We have compared REE concentrations and mineralogy through weathering profiles and the proportion of light versus heavy REE in weathered A-type granites from each island. Fresh granites from the three islands (with average %) consist of K-feldspar (40%), plagioclase (20%), quartz (35%), and biotite (<5%) with trace amounts of chlorite, amphibole, apatite, and zircon. The main REE-bearing minerals in weathered granites from Besar Island are monazite-(Ce), xenotime-(Yb), and bastnaesite-(Ce), whereas those from Hujung and Tengah islands both contain monazite-(Ce) and allanite-(La). Relatively intense weathering observed in Besar profiles has produced abundant kaolinite group minerals that have preferentially retained LREE, producing high LREE/HREE ratios in weathering products. The differences in granite compositions between the islands can be linked to primary mineralogy and degree of weathering, the latter controlling the type and volume of secondary minerals.