ABSTRACTS OF PAPERS

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GRANITIC ROCKS OF PENANG ISLAND: MINOR AND TRACE ELEMENT VARIATION PATTERNS AND IMPLICATIONS

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Penang Island is made up of variably textured highly evolved peraluminous S-type granitic rocks. Two petrographic suites, Bt. Bendera and Sg. Ara, have been identified by Liew (1983) which broadly correspond to the Penang and Kg. Batak Plutons of Cobbing *et al.*, (1986) respectively. Using currently available minor and trace element data petrogenetic aspects of the two suites are examined.

Harker variation diagrams and other inter-element variation patterns reveal the following characteristic features:

(1) In Bt. Bendera suite, high field strength elements Ti, Zr and P correlate positively with each other, but negatively with SiO_2 implying that these elements behaved as compatible elements with bulk partition coefficients more than unity. In Sg. Ara suite, while Ti and Zr behaved as compatible elements, P characteristically remained incompatible. Ti-P and Ti-Zr relationships clearly distinguish these two suites.

(2) Both suites display similar variation patterns for Rb, Sr and Ba. Sr and Ba are antipathetic to Rb and SiO_2. Evidently Sr and Ba behaved as compatible elements.

(3) Th, Y and Ce appear as incompatible elements in Sg. Ara suite, but show complicated behaviour in Bt. Bendera suite. Significantly, high-Y Bt. Bendera samples have low P_2O_5 values.

(4) Variation trends of several elements are very close for the two suites, but certain inter-element relationships are significantly different (e.g. Th-Ti, Y-Zr, Y-Ti).

(5) Small but perceptible compositional differences exist between the two suites. Ti, Zr, Sr, Y, Ce are relatively (for a given SiO_2) lower and Rb higher in the Sg. Ara suite.

(6) Variation patterns involving Y, Th, Sn are not uniform in Bt. Bendera, but define clusters with different trends. Some of the clusters are quite close to Sg. Ara trend. Sn seems to be a compatible element, particularly in Bt. Bendera suite and this may have a bearing on the question of lack of tin mineralization.

Consideration and analysis of the above characteristics lead to the following conclusions:

(i) Sg. Ara and Bt Bendera suites cannot be regarded as parts of a single fractionated intrusive sequence sampled at different levels of erosion (or at different points). These two suites have evolved through fractionation of two different parental magmas formed by separate crustal melting events. Trace and minor element data do not point to a significantly different crustal source for the two suites. They are consistent with the idea that Bt. Bendera magma has formed from the same source from which Sg. Ara magma has been withdrawn in an earlier melting event.

(ii) Bt. Bendera suite is composite and could not have formed by differentiation of a single parental magma.

(iii) It is possible to group some of the Bt. Bendera samples with the Sg. Ara suite implying a genetic connection between them - a possibility that warrants further study as it addresses to a fundamental question pertaining to the evolution of the two suites.

(iv) Granites of the Kulim complex may be genetically related to the granites of Penang.