

Petrology and geochemistry of the Sempah volcanic complex : Peninsular Malaysia

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Abstract: The Sempah volcanic complex is characterized by a sequence of tuffs, rhyolite lava and an orthopyroxene bearing subvolcanic unit exposed along the Selangor-Pahang state boundary. Previous radiogenic dating of the complex using Rb-Sr method yield ages in the range of 211 to 219 Ma and suggests that it may be temporally related to the Triassic Main Range Granites. The two main rock types of the complex are rhyolite and orthopyroxene-bearing rhyodacite. They are porphyritic and have similar phenocryst assemblage (quartz, biotite, K-feldspar and plagioclase) except for the presence of hypersthene in the orthopyroxene-bearing rhyodacite. Geochemically both units are peraluminous, high-K calc alkaline and display S type affinities. Both rhyolite and orthopyroxene rhyodacite are inferred to be individual batches of melt. Although they have very similar SiO₂ content, the two groups display contrasting trends for many of the trace and major element diagrams. High ⁸⁷Sr/⁸⁶Sr isotope values, different mineral extract proportion in the major elements modelling and non-horizontal trend on the ⁸⁷Sr/⁸⁶Sr vs. 1/Sr plot preclude crystal fractionation as the main process operating in the complex. Modelling confirms that the cause of the chemical diversity between both rocks can be explained by combined assimilation – fractional crystallization (AFC) and that approximately 20% of both magmas were contaminated during emplacement. It is inferred that the water content of the orthopyroxene rhyodacite magma was between 2.5 to 3 % with pressure regime of 3 – 4 kbar and a temperature approximately 800 - 900°C when rapid quenching of the groundmass occurred. The rhyolite magma, however was generated at shallower crustal levels, probably between 700 - 800°C.