Significance of the petrography and geochemistry of the igneous rocks at Kulai-Skudai, Johor

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The Kulai-Skudai area is mainly underlain by igneous (80%) and sedimentary (20%) rocks where the igneous rocks are mainly plutonic and volcanic in nature and vary from basic to acidic in composition.

Gabbro, the basic intrusive body at Linden estate is believed to be the oldest rock in the area, which is Permian to Carboniferous in age (van Bemmelen in Burton, 1973). This fact is strongly supported by results from geochemical analysis where the D.I. value of the gabbro is 4.31, which is the lowest value compared to the other granitoids of the area. This shows that the gabbro have the earliest history of crystallization and is indeed the oldest rock in the area. Results from geochemical analysis also show that the gabbro is tholeiitic in nature. From petrographic studies, the gabbro comprises mainly clinopyroxene, orthopyroxene, plagioclase and minor olivine and hornblende. Cumulate texture is shown by the orthopyroxene (hypersthene), the cumulus mineral surrounding olivine and plagioclase crystals.

The granitoids of the area are fine grained granite, porphyritic adamellite, medium grained adamellite, elongated quartz adamellite, pink adamellite, granodiorite and coarse to fine grained tonalite. Previous studies show that the age of these granitoids is early Triassic and early Cretaceous. From geochemical and petrography studies, the granitoids are classified as I-type, metaluminous and mineralogically comprises of plagioclase, alkali feldspar, quartz, biotite and hornblende. Apatite, opaque minerals (pyrite) and epidote are common in most of the granitoids in the area. Geochemical and petrographic studies also show that the emplacement of the granitoids was epizonal. The calc-alkaline value for the granitoid in the area is 64.70 which is almost the same as Saim's (1980). AFM and CNK diagrams also show a simple trend of magma evolution, which is the same as Liew's (1983).

The volcanic rock in the area is the Gunung Pulai volcanic member of the Jurong Formation. It is composed of plagioclase, quartz, alkali feldspar and minor biotite and epidote, set in a microcrystalline matrixs. Petrographic studies show that some of the quartz have embayment texture which is a typical characteristic for volcanic rocks. From geochemical studies, the dacite also falls within the calc-alkaline series.

Xenoliths occur in most of the igneous rocks. They are dark, round to ellipsoid in shape and vary in size and sometimes show phenocrysts of plagioclase in them. Petrographically, they are dioritic in composition and made up mainly of plagioclase, biotite and hornblende. There is also a xenolith which is enriched only with quartz, plagioclase and biotite with some rutile. Petrographic studies also show that the xenoliths are of igneous origin.

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Epidote, aplite and quartz veins also intrude most of the rocks in the study area. They are post-granitoid in age, being the last phase of magma differentiation and usually intrude following the dominant trend of joints in the igneous rocks.

Results from geochemical analysis using Harker's and D.I. variation diagrams show that all the igneous rocks come from one single magma which is basaltic in composition and through differentiation processes, has evolved to produce other rocks such as tonalite, granodiorite, adamellite and fine grained granite in the area.

The sedimentary rocks located in the southern part of the study area belong to the Bukit Resam Clastic Member of the Jurong Formation. It comprises mainly sandstone interlayered with shale and some siltstone. The general trends of bedding for this formation are northeast-east and northwest-west. Fossils have not been found but from previous studies, fossils of lamellabranch have been found which gives the age of this formation as late Triassic to middle Jurassic (Newton in Burton, 1973).