Petrographic characteristics and aggregate properties of the dacite porphyry intrusives of Kuching area, Sarawak

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Field mapping and petrogenetic evidence indicate that in the Kuching area, the older Late Triassic to Late Cretaceous sedimentary rocks and volcanics were intruded by dacite porphyry which took the form of small stocks, dikes and sills. Petrographically, the dacite porphyry contains phenocrysts of plagioclase, hornblende and quartz set in an aphanitic groundmass of quartz and feldspars. Locally, glassy groundmass has been observed and zeolites have been identified.

The intrusives are observed to be affected by late phase magmatic/hydrothermal activities which had caused alterations to the dacite porphyry which can be visually observed on the quarry faces. The alterations identified, often occurring in different degrees of intensities at specific parts of the quarry faces include: 1) chloritization, 2) pyritization, 3) calcitization, 4) hematization and 5) kaolinization. Based on the present petrographic study, identification and recognition of various types of alteration in the field is possible.

Fresh dacitic porphyry rocks and their altered phases in all the quarries around Kuching were sampled from the quarry faces and tested for their physical and aggregate properties in the Geological Survey of Malaysia Laboratories in Ipoh. Physical and aggregate properties determined include S.G., Water Absorption, Aggregate Crushing Value, Aggregate Impact Value, 10% Fine (all according to B.S. 812) and Los Angeles Abrasion Value (ASTM 131).

Fresh dacite porphyry rocks show excellent physical and aggregate properties. On the other hand altered phases invariably show poorer physical and aggregate properties with some dipping below the requirements or specifications of aggregate properties set by the Jabatan Kerja Raya, Malaysia for various construction purposes. In the day to day operation of the quarries usually, the unaltered dacite porphyries are mixed with the altered phases, thus the properties for the commercially available aggregates are somewhere between the two values. The unaltered and altered dacite can be recognised based on field criteria and this can be used for selection at the quarry face to produce high quality aggregate for certain specific purposes.

Petrographic evidence indicates the presence of micro-crystalline and crypto-crystalline quartz (which are potentially alkali-silica reactive) in all the thin sections of the dacite porphyries. Zeolites and glassy matrix are present locally. It is recommended that if the dacite porphyry aggregates are to be used in concrete in which the alkali content in the cement portion is high (> 0.6% NaOH equiv.) the mortar bar tests (ASTM 227) be carried out to assess the alkali-silica and alkali-zeolite reactivities.

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