

# Petrology of the Morobe Granodiorite in the Kuper Range, Morobe Province, Papua New Guinea

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The Morobe Granodiorite is a composite batholith comprising of monzodiorite, monzonite, quartz monzonite, granite, granodiorite, diorite and gabbro. Mafic Microgranular Enclaves (MME) are abundant in the intrusion. The mineral assemblage of the Morobe Granodiorite comprises of hornblende, biotite, plagioclase, alkali feldspar and quartz with accessory minerals of titanite, apatite, magnetite and ilmenite. The rocks have a variety of texture, such as poikilitic, cumulous and porphyritic. The MME also has a similar mineral assemblage and texture to its host however, it is abundant in mafic minerals hornblende and biotite.

Mineral compositions for amphibole of the granodiorite and MMEs are similar, implying similar magma environment. By the iteration calculation using a geobarometer (Anderson and Smith, 1995) and a geothermometer (Blundy and Holland, 1990), we estimated the crystallization temperature of 597-766°C and the maximum crystallization pressure of 3.6 kbar. Crystallization conditions from the MME yield higher temperature (812°C) and pressure (5.3 kbar) to its host, which implies MMEs represent the deeper hotter parts of the same magma chamber of which the MME and host formed.

The geochemical signature of the Morobe Granodiorite represent calc-alkaline and metaluminous nature typical of I-type granites. The variations of major elements in the Harker diagram can be best explained by fractionation mainly of hornblende and plagioclase. The interpretation is consistent with the textural variations of the rocks. Low  $\text{FeO}^T/(\text{FeO}^T + \text{MgO})$  ratios and high Mg-number for granodioritic rocks suggest magma originated from partial melting of the lower mafic crust. This magma was contaminated upon ascent wall rock assimilations of the host rock Owen Stanley Metamorphic. This can be seen as  $\text{Na}_2\text{O}$  vs  $\text{SiO}_2$  and  $\text{K}_2\text{O}$  vs  $\text{SiO}_2$  variation diagrams.

Keywords: Morobe Granodiorite, mafic microgranular enclaves, fractional crystallization