The Benta Migmatite Complex revisited

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Rocks of the Benta Migmatite Complex that outcrop in two localities near Benta, Pahang have been described by Hutchison (1971). The localities are an exposure around Jeram Besu, a river rapids, and a now-abandoned rock quarry about 1 km away. Based on relationships among these rocks in the field together with a study of their petrography, Hutchison proposed the origin and temporal relationships of the rocks.

In 1994, I had the opportunity to visit the two localities described by Hutchison, whereby I managed to find some additional field relationships between these rocks. These new observations together with chemical analyses carried out on these rocks, warrant a reinterpretation of Hutchison's report.

This paper will focus on the petrogenesis aspect of the rocks based on the additional data mentioned above and will refer to Hutchison's interpretation for comparison. The nomenclature of the rocks as proposed by Hutchison is retained for convenience and simplicity of discussion. Basically, five types of rocks are found in the two localities. Hutchison named them migmatitic psammitic gneiss (rock A), coarse-grained well foliated gneiss (rock B), dark-green hornblende-biotite schist (rock C), porphyritic monzonite (rock D) and microgranite dyke (rock E).

The microgranite dyke (rock E), as implied by its name, is undoubtedly the youngest of the five rocks. Hutchison noted a concordancy between psammitic gneiss (rock A) and well foliated gneiss (rock B), and suggested that these two rocks were formerly lithic sandstone and andesitic tuff interbeds which underwent metasomatism.

The well foliated gneiss (rock B) and porphyritic monzonite (rock D) are quite similar in that both are porphyritic and possess similar mineralogy. However, the feldspar phenocrysts in rock B are strongly aligned compared to the random arrangement in rock D. Field relationships between these two rocks suggests rock D could have been a derivative of rock B. From the chemistry of these rocks I believe that rock D had evolved from rock B by partial differentiation, although Hutchison was not sure whether it was partial or complete differentiation.

Hutchison could not make out the relationship of the hornblende-biotite schist (rock C). He only saw xenoliths of rock C in the porphyritic monzonite (rock D) and did not see any field relationship with other rocks.

However, I found xenoliths of hornblende-biotite schist (rock C) in the well foliated gneiss (rock B) and furthermore found that these two rocks to be quite similar in chemical composition. The field and chemical relationships suggest that rock B had evolved from rock C by complete differentiation. Xenoliths of rock C in rock B are interpreted as the unaltered and relatively immobile source/rock C. In light of the status of well foliated gneiss (rock B) being considered as an element of migmatite, then the source rock C could be appropriately interpreted as the paleosome of rock B

Thus, up to this point it has been shown that hornblende-biotite schist (rock C) had evolved (by anatexis) to well foliated gneiss (rock B), which in turn evolved by partial differentiation to porphyritic monzonite (rock D).

My conclusion on the derivative of well foliated gneiss (rock B) therefore differ from that by Hutchison who suggested that it could have been derived from andesitic tuff which was interbedded with lithic sandstone (later to become rock A).

I suggest that rock B and rock A must have been rocks from separate localities and that rock B had intruded into rock A, thereby resulting rock A being found as xenoliths in rock B.

Chemical results show that psammitic gneiss (rock A) are too siliceous compared to well foliated gneiss (rock B). This means that the melting temperatures of these two rocks (assuming isobaric) differ quite significantly. Being the more siliceous, the temperature of melting of rock A is much lower than that of rock B. If these two rocks had been interbedded as suggested by Hutchison, and had once been subjected to a high temperature and pressure regime, rock A would have melted much earlier than rock B. Owing to gravitational buoyancy. rock A would have 'sweated' out of rock B, leaving the latter completely free of any trace of rock A. The presence of rock A in rock B could not have originated from syndepositional relationship but more likely resulted from intrusive relationship.