Myrmekite from the charnockitic rocks of the Eastern Ghats, India—a discussion

SIR,—In his paper on these rocks Dr Bhattacharyya (1971) has given a concise summary of four hypotheses on myrmekite genesis and has dealt with each as he sees them applied to his rocks. He believes that the myrmekite in the charnockites of the Eastern Ghats originated by the replacement of plagioclase by potash feldspar, and suggests that the presence of marginal myrmekite around potash feldspar megacrysts and its absence about plagioclase inclusions within them is due to stress differences at the two sites.

I find it difficult to understand how the replacement of plagioclase by potash feldspar can give rise to excess silica. Indeed the *reverse* reaction (Becke, 1908) is usually cited to explain the release of silica, for example:

$$\underset{\text{(potash feldspar)}}{2KAlSi_3O_8} + Ca \rightarrow \underset{\text{(anorthite)}}{CaAl_2Si_2O_8} + \underset{\text{(quartz)}}{4SiO_2} + 2K$$

A reaction going the opposite way would surely require silica to form potash feldspar, and in this manner silica would be removed from the system. Under these circumstances it could hardly be available for crystallization as the quartz of myrmekite. Perhaps Dr Bhattacharyya would elaborate further on this matter. He may mean that 'the early melting fraction' contains silica not involved with feldspar formation, and that this later becomes available for development as quartz vermicules. However, this is not clearly stated.

The role of stress in the location of myrmekite sites, involving its presence at megacrystal potash feldspar margins but its absence on plagioclase inclusions within a potash feldspar megacryst, is undoubtedly complex. I wonder if there is in fact any significant pressure differential across a potash feldspar crystal growing by replacement. Such matters are perhaps best left to those well versed in the understanding of the physical aspects of crystal growth in the solid state.

There is a comment that should be made concerning this difference in location for possible myrmekite development. Parslow (1971, p. 52 & fig. 3) has also noted '. . . the absence of myrmekite deep within the poikilitic microclines', so Bhattacharyya is not alone in his observations. Dr Parslow was kind enough to let me see some of his thin-sections and I agree with his descriptions. This does not mean, however, that all potash feldspar megacrysts lack internal myrmekite bordering plagioclase inclusions. I have seen potash feldspar megacrysts in unstrained granitic rocks which contain plagioclase inclusions partially rimmed by myrmekite (usually in association with quartz-free rim albite) and a similar texture has been reported by Kerrick (1969, p. 843). The notion that no internal myrmekite can be found within potash feldspar megacrysts may become generally accepted. I have stressed this matter to try to prevent such a situation developing.

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SIR,—Thanks are due to Dr. Phillips for bringing my attention to a few important points not clearly dealt with in my paper on myrmekite (Bhattacharyya, 1971).

The inappropriate use of the words 'excess silica' (Bhattacharyya, 1971, p. 435) instead of 'residual silica' certainly has confused Phillips as to the source of myrmekitic quartz.

The higher pressure of feldspathic fluid at the margin compared to the central part Bhattacharyya, 1971, Fig. 1) can be explained with reference to Bernouilli's law which expresses the conservation of momentum in fluid flow. As per the law, for a horizontal streamline flow, the sum of the velocity head and the pressure head is constant. Therefore, where pressure head is low, velocity head is high and vice versa. If the flow is not horizontal, a more general situation in the case of magmatic flow, even then the pressure head is likely to balance the loss or gain in velocity head provided the entire loss or gain is not completely compensated by gain or loss in gravitational head. If turbulent flow is involved, the situation is quite complex.

Turning to Figure 1 of my paper it can be conceived that the megacrystal K-feldspar, with steady supply of feldspathic fluid, has had to grow by exerting some amount of side pressure and the residual siliceous material still in the fluid stage and presumably concentrated along the peripheral region of the growing megacryst, would suffer side-push resulting in the replacement of strained plagioclase in contact, forming myrmekite. The straining of plagioclase may either be synchronous with the development of myrmekite or of premyrmekite origin. Silica, apart from residual liquid, may have been generated also by partial melting of these rocks as stated by me and pointed out by Phillips.

The schematic diagram of my paper (Figure 1) is in fact a reconstruction from two thin sections, one of which has the grain-relation as shown in Plate 1*b*. From the above observations I think that the micro-strain pattern in the rocks may have some role in the location of the myrmekite site. On the basis of such interpretation, one should expect myrmekite more frequently in that granitic rock which is more strained.

Regarding the last comment of Phillips, I would like to say that K-feldspar megacrysts in the thin sections I have examined from the Srikakulam district lack internal myrmekite. Incidentally, however, I examined quite a large number of slides of Kodarma granite, Bihar, in which internal myrmekite in association with quartz-free albite rim is present but very rarely.

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