Canadian Mineralogist
Vol. 16, pp. 277-279 (1978)

THE REACTION FORMING CORDIERITE FROM GARNET, THE KHTADA LAKE METAMORPHIC COMPLEX, BRITISH COLUMBIA: DISCUSSION

ROBERT J. TRACY
Department of Geological Sciences, Harvard University, Cambridge, Massachusetts 02138, U.S.A.

STEVEN M. RICHARDSON
Department of Earth Sciences, Iowa State University, Ames, Iowa 50011, U.S.A.

We would like to take issue with a statement made by Hollister (1977) regarding garnet and cordierite zoning. In the *Conclusion* of his paper, he says, "The interpretation of the zoning profiles of the garnets rimmed by cordierite is consistent with the conclusion of Loomis (1975) that garnet, when it is resorbed in a reaction, does not maintain partition equilibrium with the reaction products, except at its extreme edge. This conclusion is contrary to that of Richardson (1974) and which was accepted by Thompson (1976). These authors interpret features, apparently similar to those given in the present papers, as resulting from retrograde exchange between garnet and cordierite. It is difficult to reconcile their interpretation with Mn and Ca zoning in garnet as described in the present paper."

It is indeed difficult to reconcile the interpretations of Richardson (1974, 1975), Lasaga *et al.* (1977), Thompson (1976) and Tracy *et al.* (1976), as well as those of Hess (1971), with the data presented by Hollister (1977), but the difficulty lies in the substantial petrological and tectonic differences between central Massachusetts and the Khtada Lake complex of British Columbia. We recognize the validity of Hollister's interpretation for the British Columbia rocks; his reaction mechanism appears to be the most appropriate explanation for the petrographic textural features he reports, as it is for those studied by Loomis (1975). On the other hand, the textures of the central Massachusetts granulite rocks are quite different. There is no evidence in central Massachusetts for a disequilibrium between garnet and sillimanite, which are commonly in contact, and there is no shell of cordierite around garnets. The localized zoning described by Richardson (1974, 1975) occurs where random grains of cordierite or biotite are in contact with garnet. Biotite, cordierite and garnet are zoned only in Fe and Mg; there is no evidence of Ca or Mn zoning (Tracy *et al.* 1976, Fig. 5) in contrast to Hollister's observations for the suite of rocks from British Columbia. The localization of zoning, the lack of reaction textures and the shape and sense of zoning profiles strongly suggest retrograde cation exchange during cooling. Hollister's proposed reaction 5 (1977, p. 222) is appropriate for the P-T history of the rocks he is studying; these apparently underwent a late-stage decompression that promoted recrystallization of garnet and sillimanite to cordierite. Recent work in central New England, however, suggests a late-stage pressure increase (Robinson *et al.* 1977), which supports the petrographic and chemical evidence that garnet and sillimanite are not breaking down to cordierite.

We would like to emphasize that caution must be exercised in applying petrologic interpretations of metamorphic rocks in one area to rocks in different geographic, and possibly tectonic, environments. All rocks should, of course, be described within a general petrologic framework, but inferred reaction mechanisms for any particular rock unit must be consistent with its regional tectonic setting. This caution is particularly important when mineral compositions are used in geothermometry and geobarometry.

REFERENCES

The references have been listed at the end of the reply.

Manuscript received February 1978.