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also analyses and B.E.T. surface area measurements were obtained through the courtesy of Dr. W. R. Ramsom and of Dr. P. L. Walker respectively.

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# *Mechanism of formation of forsterite and enstatite from serpentine*

By G. W. BRINDLEY, M.Sc., Ph.D., and RYOZO HAYAMI, M.S.

Materials Research Laboratory, The Pennsylvania State University, University Park, Pennsylvania, U.S.A.

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*Summary.* Forsterite formed from serpentine powders at various temperatures up to 800° C has been measured quantitatively by X-ray diffraction. The results are considered in relation to a reaction mechanism proposed by Ball and Taylor and are shown to be inconsistent with the details of this mechanism. An alternative mechanism is proposed by which all or nearly all the Mg ions together with some of the Si ions liberated in the reaction zones where water is formed migrate into regions where forsterite is formed. This mechanism is in closer accord with the experimental results. The retarded development of enstatite until temperatures above 1010° C are used is attributed to the nature of the reaction by which it is formed, namely a reaction between forsterite and silica.

THE dehydration and subsequent recrystallization of serpentine minerals, both platy and fibrous forms, have been the subject of numerous investigations.[1] The principal recrystallization product, forsterite, is formed topotactically, i.e., with well-defined crystallographic orientations with respect to the parent crystal structure. Considerable interest has been taken in possible mechanisms by which these topotaxial relations are developed. Brindley and Zussman (1957) studied a platy form of serpentine, lizardite, and interpreted their data in terms of a homogeneous reorganization of cations within a largely constant oxygen framework, with an expulsion of Si ions in excess of requirements for the formation of forsterite.

More recently, Ball and Taylor (1961, 1963), Taylor (1962), and independently Brindley (1961, 1963) have suggested that more satisfactory explanations for this and for other topotactic reactions in hydroxides, silicates, and other materials can be given in terms of *heterogeneous* rather than *homogeneous* processes. Reactions initiated at favorable sites such as external surfaces, dislocations, &c., are maintained by appropriate diffusions of cations up to and away from the reaction front. Dehydroxylation of a mineral such as serpentine may proceed by migration of $H^+$ ions to a reaction site where water is formed and

[1] Ball and Taylor (1963) give references to earlier work.

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