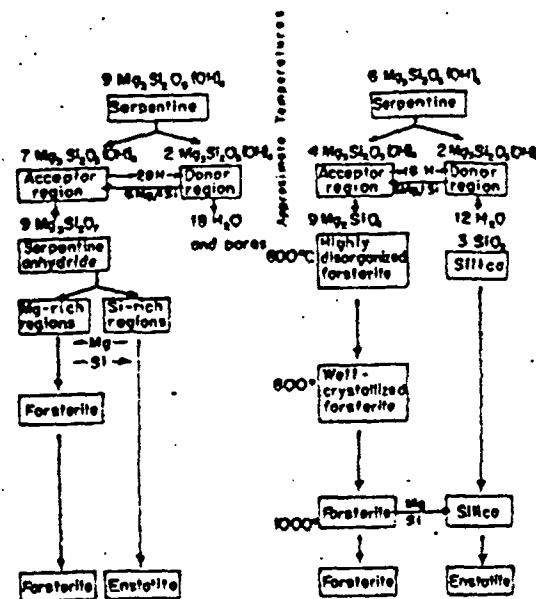




Ball - Taylor
Reaction Scheme

Brindley - Hayami
Reaction Scheme

FIG. 2. Comparison of reaction schemes proposed by Ball and Taylor and by the present writers.

and Si-rich regions are developed giving rise respectively to forsterite and enstatite.

An alternative form of the 'donor-acceptor' mechanism

It has been shown previously (Brindley, 1961, 1963) that the topotactic relationship between serpentine and forsterite leads to the conclusion that eight unit cells of serpentine become nine unit cells of

forsterite, and in these corresponding volumes, namely $8V$ and $9V$, there are the following numbers of ions: $8V$ contains 48 Mg, 32 Si, 144 O, 64 H; $9V$ contains 72 Mg, 36 Si, 144 O. Thus the overall cation 'exchange' is: $24 \text{ Mg} + 4 \text{ Si} \rightleftharpoons 64 \text{ H}$, or $6 \text{ Mg} + 1 \text{ Si} \rightleftharpoons 16 \text{ H}$.

On this view, the 'donor' regions where water molecules are formed donate $(6 \text{ Mg} + 1 \text{ Si})$ to the 'acceptor' regions in exchange for 16 protons. A highly disordered situation arises in which the 'donor' regions are probably largely siliceous and the 'acceptor' regions have a composition approximating to that of forsterite. With heat-treatment the 'acceptor' regions become organized in small domains of forsterite, which accommodate practically all the Mg ions of the original serpentine. The domains show little tendency to enlarge their size with the heat-treatments employed.

The difficulty of forming enstatite is seen as arising from the nature of the reaction involved, namely a reaction between a more-or-less stable forsterite and excess silica.

The two mechanisms proposed are set out schematically in fig. 2, which shows the quantitative relations involved and the approximate temperatures at which reactions occur. The mechanism proposed by the present writers takes into account the high proportion of the MgO content that enters into forsterite and offers a simple explanation for the delayed appearance of enstatite.

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