STABILITY AND STRUCTURAL RELATIONS OF (Mg, Fe) METASILICATES



enstatite, which is commonly regarded as the stable low-temperature polymorph of $MgSiO_3$. The synthesis of pure rhombic $MgSiO_3$ is not possible at 1 atm. Therefore it is necessary to apply either hydrothermal conditions or high pressures. The synthesis of the pure rhombic enstatite described in this study, was performed at 25 kb and 1300 °C, starting with low-clinoenstatite.

If large quantities are needed, it is more convenient to synthetize the rhombic phase at 1 atm at about 960 °C with LiF or LiOH as a flux. These fluxes cause a marked lowering of the transition temperatures and an increase of the transformation enthalpies.

The calorimetric investigations revealed that the rhombic enstatite forms the phase of higher enthalpy and entropy with respect to low-clinoenstatite. Lowclinoenstatite should be stable below 600 °C, which is in good agreement with the transformation temperature of 630 °C, extrapolated by BOYD and ENGLAND (1965) from high pressure experiments. Because enstatite is the less dense phase (as the lattice constants and the optical constants in table 1 demonstrate), high pressures will lead to an extension of the field of low-clinoenstatite to higher temperatures at the expense of the field of the orthopyroxene.

However, the latter will extend its field of stability

TABLE 1	
Pure synthetic enstatite:	Pure synthetic low-clinoenstatite:
optics:	
$n_{\rm a} = 1.647$	$n_{\rm a} = 1.650$
$n_{\beta} = 1.649$	$n_{\beta} = 1.653$
$n_{\gamma} = 1.657 (R. Schwab)$	$n_{\gamma} = 1.660$ (R. Schwab)
lattice constants:	
$a_0 = 18.203 \text{ Å}$	$a_0 = 9.604 \text{ Å}$
$b_0 = 8.807 \text{ Å}$	$b_0 = 8.815 \text{ Å}$
$c_0 = 5.202 \text{ Å}$	$c_0 = 5.170 \text{ Å}$ $\beta = 71.65^{\circ}$
$\frac{1}{2}V = 416.97 \text{ Å}^3$	$\frac{1}{2}V = 415.47 \text{ Å}^3$ (PEROTTA and
(R. Schwab)	STEPHENSON, 1965)

453

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