American Mineralogist, Volume 94, pages 34–40, 2009

Coexistence of pyroxenes jadeite, omphacite, and diopside/hedenbergite in an albite-omphacite rock from a serpentinite mélange in the Kurosegawa Zone of Central Kyushu, Japan

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Abstract

An albite-omphacite rock, containing the three sodic pyroxenes of the jadeite-omphacite-diopside/hedenbergite ternary system, has been investigated in detail to better characterize the phase relationships in this system. The rock is from a serpentinite mélange in the Kurosegawa Zone of Central Kyushu, Japan, and exhibits an omphacite overgrowth over diopside/hedenbergite and the further overgrowth of jadeite over omphacite, indicative of the successive replacement of pyroxenes during metamorphism. Partial replacement of omphacite by diopside/hedenbergite at the margins of K-feldspar veins suggests that all three pyroxenes were stable locally at the same stage of metamorphism. The peak temperature and pressure conditions are roughly estimated to be 350 °C and 5–10.8 kbar. Partitioning of Fe^{2+}-Mg between pyroxene pairs is consistent with a recent thermodynamic model, indicating the attainment of local equilibrium for pyroxene pairs. The observed compositional gap is also consistent with the miscibility gap reported in many previous studies. The compositional field of omphacite in the ternary jadeite-aegirine-diopside/hedenbergite diagram extends from the jadeite-diopside/hedenbergite line toward the aegirine-rich field, maintaining approximately constant the jadeite content, resulting in an asymmetric phase diagram.

Keywords: Miscibility gap, jadeite, omphacite, celsian, hyalophane