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Qandilite (Mg_2TiO_4) in Vesuvius skarn lithics: Conditions of formation and miscibility gap in the ternary spinel – qandilite - magnesioferrite

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The carbonate host-rocks of the Vesuvius magma chamber(s) are involved in fluid-rock interactions during magma storage, whose consequences on the pre-eruptive conditions are the aim of a continuing study (Principe et al. 2003, Pascal et al. 2009) focussed to the reconstruction of the pre-eruptive conditions in the 1631 magma chamber. Such interactions are recorded by skarn tephra, in which we have found a variety of coexisting minerals of the spinel group with compositions close to the ternary system spinel – qandilite - magnesioferrite (with a small amount of Fe^{2+}), some of which correspond to qandilite much richer in Al than any composition already reported. The large compositional range displayed by these minerals in the Vesuvius occurrences outlines the miscibility gap in the spinel – qandilite – magnesioferrite ternary (with a small amount of Fe^{2+}), at present solely determined on the spinel-qandilite binary at T > 1000°C (Boden & Glasser 1973). The analyzed spinel-qandilite and spinel-magnesioferrite pairs are consistent with the solvus and tie-lines (except for a temperature offset) derived from the thermochemical model of spinel solid solutions of Sack & Ghiorso (1991). Formation temperatures in the range 650 – 700°C are inferred from the petrological study of the involved skarn-forming processes, that typically include two types of metasomatic reactions, i.e., formation of spinel-forsterite-calcite endoskarns by desilication of magmatic bodies at the contact of dolostone wallrocks, and reaction of such preexisting endoskarns with new magma+/-fluid influxes. Calculated phase relations yield $\log fCO_2$ = 2.2-2.3, $\log fO_2$ = NNO+4, and show that qandilite with moderate magnesioferrite contents, compared to perovskite and geikielite, is the high-temperature Ti-mineral stable in magnesian and extremely silica-deficient surroundings under such oxidized conditions.

Boden, P., Glasser, F.P. (1973) Phase relations in the system $MgO-Al_2O_3-TiO_2$. Transactions and Journal of the British Ceramic Society 72, 215-220.
Pascal, M.L., Di Muro, A., Fonteilles, M., Principe, C. (2009) Zirconolite and calzirtite in banded forsterite-spinel-calcite skarn ejecta from the 1631 eruption of Vesuvius: inferences for the magma-wallrock interactions. Mineralogical Magazine 73, 333-356.
Principe, C., Giosa, P., Cerbai, I., Crocetti, S., Franceschini, F., Marini, L., Gambardella, B., Buettner A. and Rosi, M. (2003) A dynamic model for the 1631 Vesuvius eruption. Geophysical Research Abstracts, 5, 05432.
Sack, R.O., Ghiorso, M.S. (1991) An internally-consistent model for the thermodynamic properties of Fe-Mg-titanomagnetite-aluminate spinels. Contributions to Mineralogy and Petrology 106, 474-505.