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Kinoshitalite, $Ba(Mg)_3(Al_2Si_2)O_{10}(OH,F)_2$, a brittle mica from a manganese deposit in Oman: Paragenesis and crystal chemistry

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ABSTRACT

Kinoshitalite, ideally $Ba(Mg)_3(Al_2Si_2)O_{10}(OH,F)_2$, was studied in a granulite-facies manganese ore associated with calcium-bearing magnesian tephroite, hausmannite, calcite and manganoan clinochlore, and in a second assemblage together with hausmannite, altered tephroite, manganoan diopside, and calcite. The metamorphic rocks occur enclosed in peridotites of the Semail Ophiolite, Sultanate of Oman and were metamorphosed during ophiolite obduction.

Single-crystal X-ray data, collected on an inclusion-free kinoshitalite of $Ba_{0.99}K_{0.06}Na_{0.01}(Mg_{2.64}Mn_{0.31}Al_{2.01}Si_{2.03})O_{10}(OH_{1.61}F_{0.37}Cl_{0.02})$ composition, yielded a *C*-centered lattice of monoclinic symmetry with a = 5.316(1), b = 9.230(2), c =10.197(2) Å, β = 100.06(1)°, V = 492.6 Å^3, and Z = 1 characteristic of the 1 *M* polytype. The structure was refined in two models assuming complete Si, Al ordering in the space groups $C2$ and $C\bar{1}$ allowing for additional twinning. The data clearly suggest that in spite of the Si/Al ratio of 1 assumption of complete Si, Al ordering can be rejected. Two models, both in agreement with space group $C2/m$, causing Si, Al disorder, are discussed. Three-dimensional Si, Al disorder would lead to violation of the Al avoidance rule and substantial Ba displacement. The rather well defined Ba position capped by two six-membered rings of $Si_3Al_3O_{18}$ composition suggests one dimensional disorder where completely Si, Al ordered layers exist parallel to (001). The disorder occurs perpendicular to (001) and may be interpreted as random stacking faults.