

Magnesiohögbohmite-2N4S: A new polysome from the central Sør Rondane Mountains, East Antarctica

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ABSTRACT

Högbohmite-group minerals are complex Fe-Mg-Zn-Al-Ti oxides related to the spinel group. Their polysomatic structure is composed of spinel (*S*) and nolanite (*N*) modules. The new polysome magnesiohögbohmite-2N4S (IMA 2010-084) was found in the Sør Rondane Mountains, East Antarctica. It occurs in Mg-Al-rich, Si-poor skarns, characterized by a corundum-spinel-phlogopite-clinocllore assemblage. The new magnesiohögbohmite polysome formed during the retrograde metamorphic stage.

Magnesiohögbohmite-2N4S appears macroscopically orange red, the streak is light orange colored. Euhedral crystals are hexagonal plates or prisms with cleavage planes on {001}. The mineral is optically uniaxial (–) and pleochroic with *O* = reddish brown and *E* = pale brown. The mean refractive index calculated from reflectance data in air at 589 nm is 1.85(3). The calculated density is 3.702(2) g/cm³. The Mohs hardness is 6.5–7, and VHN₃₀₀ = 1020–1051, mean 1032 kg/mm².

The crystal structure of the new polysome magnesiohögbohmite-2N4S has been solved and refined (*R*1 = 2.74%) from single-crystal XRD data. The crystal chemical formula is T₁₀M₂₄O₄₆(OH)₂ where T and M represent tetrahedral and octahedral sites. The mineral is hexagonal, space group *P6₃mc* (no. 186), *a* = 5.71050(10), *c* = 27.6760(4) Å, *Z* = 1, *V* = 781.60(2) Å³. The strongest lines in the powder XRD pattern [*d* (Å), *I* (%), *hkl*] are: 2.8561(4), 37, 110; 2.6120(3), 39, 109; 2.42818(16), 100, 116; 2.4160(4), 39, 1010; 2.01181(13), 50, 208; 1.54892(16), 35, 2110; 1.42785(6), 57, 220. Strongest peaks in Raman spectra are at 302, 419, 479, 498, 709, 780, and 872 cm^{–1}, with a broad OH-characteristic absorption around 3400 cm^{–1}. The mean chemical composition (wt%) is SiO₂ 0.05, TiO₂ 7.08, SnO₂ 0.15, Al₂O₃ 66.03, Cr₂O₃ 0.02, Fe₂O₃ 0.50, FeO 4.87, MnO 0.06, MgO 18.71, CaO 0.01, ZnO 0.96, NiO 0.01, CoO 0.02, F 0.06, Cl 0.01, H₂O 1.00, sum 99.51. The simplified formula is (Mg_{8.2}Fe_{1.2}Zn_{0.2})²⁺(Al_{22.7}Fe_{0.1})³⁺Ti_{1.6}O₄₆(OH)₂ and ideal formula is Mg₁₀Al₂₂Ti₂O₄₆(OH)₂. This mineral is a solid solution between the two ideal end-members, (Mg,Fe,Zn)₁₀(Al,Fe)₂₂Ti₂O₄₆(OH)₂ and (Mg,Fe,Zn)₈²⁺(Al,Fe)₂₆O₄₆(OH)₂.

Keywords: Högbohmite, polysomatism, crystal structure, corundum, spinel, Sør Rondane Mountains, East Antarctica