Tantalowodginite: A New Mineral from the Emmons Pegmatite, Uncle Tom Mountain, Greenwood, Oxford Co., Maine, USA

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Wodginite Group minerals have the general formula ABC_2O_8 and are classified based on the dominant cation at each individual site. Wodginite species include: wodginite ($MnSnTa_2O_8$), ferrowodginite ($Fe^{2+}SnTa_2O_8$), titanowodginite ($MnTiTa_2O_8$), lithiowodginite ($LiTaTa_2O_8$), and ferrotitanowodginite ($Fe^{2+}TiTa_2O_8$). Tantalowodginite, a Ta-rich member of the wodginite group, has been identified from the Emmons pegmatite in Oxford County, Maine where it is associated with wodginite and columbite-tantalite group minerals. This mineral was recently approved by the IMA Commission on New Minerals, Nomenclature and Classification (IMA2017-095). The type specimen is deposited in the mineralogical collection of the Maine Mineral & Gem Museum, Maine, U.S.A.

The Emmons LCT-type pegmatite is complexly zoned with a wall zone, several intermediate zones, and a poorly exposed quartz-rich core. Replacement units along the core-intermediate zone boundary have undergone almost complete alteration and replacement with muscovite as the only primary remaining mineral. Tantalowodginite occurs in the pegmatite core as primary anhedral masses (0.5 to 12 cm) and rarely as crystals (0.2-1 cm) in miarolitic cavities associated with muscovite and fluorapatite. It is orange to deep red with a vitreous to sub-adamantine luster, and is rimmed with either black wodginite or columbite-(Mn). Crystals, when present, are generally elongated, blunted dipyramidal forms, but rounded and wedge habits are also present. Tantalowodginite has a yellowish tan streak, is brittle with a conchoidal fracture, and shows a distinct {100} cleavage. The Mohs hardness is 5.5. The calculated density is 7.87 g/cm^3 and the measured density is 7.61(0.001) g/cm^3.

The empirical formula, calculated on the basis of 8 oxygen atoms per formula unit from the average of six electron microprobe analyses is: $(Mn_{0.58}Li_{0.24}Fe_{0.02\&Square0.16})_{\Sigma 1.00}(Ta_{0.62}Sn_{0.36}Ti_{0.01})_{\Sigma 0.99}(Ta_{1.83}Nb_{0.17})_{\Sigma 2.00}O_8$. The idealized formula is $(Mn_{0.5\&Square0.5})TaTa_2O_8$.

X-ray diffraction data show tantalowodginite is monoclinic, space group C2/c. The refined unit-cell parameters are a = 9.542(1)Å, b = 11.488(2)Å, c = 5.128(1)Å, and β = 91.13(1)°, with Z = 4. The structure is comprised of three octahedrally coordinated sites. The A- and B-sites form zig-zag chains along z via edge sharing. Within these chains, the A- and B-sites alternate within the same plane. The C-sites form chains via edge sharing that lie in a different plane and connect the A-B chains sharing apexes alternately with the A and B polyhedra.

In the Emmons pegmatite, cassiterite was the early crystallizing Sn phase. With continued fractionation, Ta activity increased and tantalowodginite became the predominant Sn crystallizing phase. Later in the core formation, overgrowths of wodginite crystallized on the tantalowodginite. In contrast, tantalowodginite from the pockets is overgrown by columbite group minerals. The relative timing of the crystallization of these two overgrowth types cannot be determined. Finally, as Sn became depleted, columbite group minerals became the predominant crystallizing phase.