

Tegengrenite, a new, rhombohedral spinel-related Sb mineral from the Jakobsberg Fe-Mn deposit, Värmland, Sweden

DAN HOLTSTAM^{1,*} AND ANN-KRISTIN LARSSON²

¹Department of Mineralogy, Research Division, Swedish Museum of Natural History, Box 50007, SE-104 05 Stockholm, Sweden

²Department of Inorganic Chemistry, Arrhenius Laboratory, Stockholm University, SE-106 91 Stockholm, Sweden

ABSTRACT

Tegengrenite, forming octahedra up to 150 μm in size, occurs associated with hausmannite, calcite, brucite, dolomite, clinohumite, kinoshitalite, native copper, barytocalcite, bindheimite, and cerussite in Mn ore from Jakobsberg, Filipstad district, Värmland, Sweden. The mineral is deep red and translucent, with a sub-adamantine luster. In reflected light it is gray and nearly isotropic, with measured reflectance values ($R\%$) 10.4 ($\lambda = 470$ nm), 10.0 (546 nm), 9.9 (589 nm), and 9.8 (650 nm). The refractive index at $\lambda = 589$ nm is 1.92(2). There is no cleavage; fracture is conchoidal. D_{calc} is 4.58(1) g/cm^3 . Electron-microprobe analyses gave (average of 35 points; in wt%) MgO 21.83, Al_2O_3 0.76, SiO_2 1.70, Sb_2O_5 36.13, TiO_2 1.40, Fe_2O_3 0.78, MnO 25.74, Mn_2O_3 (calculated from stoichiometry) 8.14, ZnO 2.66, sum 99.14, yielding the empirical formula $\text{Mg}_{1.22}^{2+}\text{Mn}_{0.82}^{2+}\text{Zn}_{0.07}(\text{Sb}_{0.50}\text{Mn}_{0.23}^{3+}\text{Si}_{0.06}\text{Ti}_{0.04}\text{Al}_{0.03}\text{Fe}_{0.02})\text{O}_4$. Combined X-ray and electron diffraction studies show that tegengrenite is rhombohedral, space group $R\bar{3}$ or $R3$, and pseudocubic. The individual tegengrenite octahedra consist of eight twin domains that give rise to complex diffraction patterns and make them unsuitable for a conventional structure determination. Tegengrenite, like the chemically related mineral filipstadite, bears a close structural relationship to spinel. The eight strongest lines in the X-ray diffraction pattern are [d (in angstroms) (hkl)]: 4.98(20)(211, 003), 4.32(19)(122), 4.24(18)(113), 3.052(33)(140, 214), 2.608(100)(241, 143, 125), 2.162(28)(244), 1.665(30)(363, 075), 1.531(26)(820) and 1.527(29)(428). The refined unit-cell parameters (hexagonal setting) are $a = 16.196(1)$ and $c = 14.948(2)$ Å with $Z = 42$; for the cubic spinel-type subcell $A = c/\sqrt{3} = 8.63$ Å. The new species is named for Felix Tegengren (1884–1980).