

Oxy-dravite, Na(Al₂Mg)(Al₅Mg)(Si₆O₁₈)(BO₃)₃(OH)₃O, a new mineral species of the tourmaline supergroup

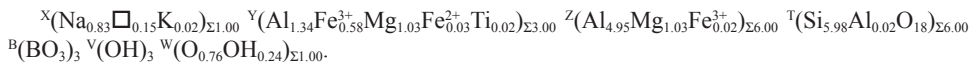
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ABSTRACT

Oxy-dravite, Na(Al₂Mg)(Al₅Mg)(Si₆O₁₈)(BO₃)₃(OH)₃O, is a new mineral of the tourmaline supergroup. The holotype specimen originates from the locality of Osarara (Narok district, Kenya) and occurs in quartz-muscovite schist. Crystals of oxy-dravite are dark red, partially translucent with a vitreous luster, a pink streak, and conchoidal fracture. It has a Mohs hardness of approximately 7, and a calculated density of 3.073 g/cm³. In plane-polarized light, oxy-dravite is pleochroic (O = orange and E = pink) and uniaxial negative: $\omega = 1.650(5)$, $\epsilon = 1.620(5)$. Oxy-dravite is rhombohedral, space group *R3m*, with the unit-cell parameters $a = 15.9273(2)$ and $c = 7.2001(1)$ Å, $V = 1581.81(4)$ Å³, $Z = 3$. Chemical characterization based on electron microprobe analysis, single-crystal structure refinement, Mössbauer, and optical spectroscopy, resulted in the empirical structural formula:



While the end-member formula of oxy-dravite may be formalized as Na^Y(Al₃)^Z(Al₄Mg₂)Si₆O₁₈(BO₃)₃(OH)₃O, the most representative structural formula is Na^Y(Al₂Mg)^Z(Al₅Mg)Si₆O₁₈(BO₃)₃(OH)₃O. The difference between these two formulas is solely in Al-Mg order-disorder, i.e., there is no difference in chemical composition. Although the Mg-Al disorder over the *Y* and *Z* sites is controlled by the short-range bond-valence requirements of O²⁻ at the O1 (\equiv W) site, the amount of Mg at the *Z* site is a function of the degree of cation size mismatch at *Z*.

The crystal structure of oxy-dravite was refined to statistical index *R*1 of 1.17% using 1586 equivalent reflections collected with MoK α X-radiation. Oxy-dravite is chemically related to dravite (and fluor-dravite), NaMg₃Al₆Si₆O₁₈(BO₃)₃(OH)₃(OH,F), by the heterovalent substitution Al³⁺ + O²⁻ \rightarrow Mg²⁺ + (OH,F)⁻.

Keywords: Oxy-dravite, tourmaline, new mineral species, crystal-structure refinement, electron microprobe, Mössbauer spectroscopy, order-disorder