

Vanadio-oxy-chromium-dravite, $\text{NaV}_3(\text{Cr}_4\text{Mg}_2)(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{O}$, a new mineral species of the tourmaline supergroup

FERDINANDO BOSI^{1,3,*}, LEONID REZNITSKII², HENRIK SKOGBY³ AND ULF HÅLENIUS³

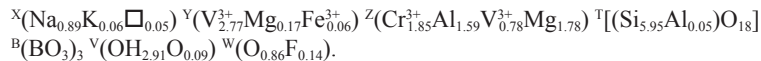
¹Dipartimento di Scienze della Terra, Sapienza Università di Roma, P.le A. Moro, 5, I-00185 Rome, Italy

²Russian Academy of Science, Siberian Branch, Institute of the Earth's Crust, Lermontova strasse, 128, Irkutsk, Russia

³Department of Geosciences, Swedish Museum of Natural History, Box 50007, SE-10405 Stockholm, Sweden

ABSTRACT

Vanadio-oxy-chromium-dravite, $\text{NaV}_3(\text{Cr}_4\text{Mg}_2)(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{O}$, is a new mineral of the tourmaline supergroup. It is found in metaquartzites of the Pereval marble quarry (Sludyanka, Lake Baikal, Russia) in association with quartz, Cr-V-bearing tremolite and muscovite-celadonite-chromphyllite-roscoelite, diopside-kosmochlor-natalyite, Cr-bearing goldmanite, esolaite-karelianite, dravite-oxy-vanadium-dravite, V-bearing titanite and rutile, ilmenite, oxyvanite-berdesinskiite, shreyerite, plagioclase, scapolite, zircon, pyrite, and an unnamed oxide of V, Cr, Ti, U, and Nb. Crystals are emerald green, transparent with a vitreous luster, pale green streak, and conchoidal fracture. Vanadio-oxy-chromium-dravite has a Mohs hardness of approximately 7½, and a calculated density of 3.3 g/cm³. In plane-polarized light, vanadio-oxy-chromium-dravite is pleochroic (O = dark green, E = pale green) and uniaxial negative: $\omega = 1.767(5)$, $\varepsilon = 1.710(5)$. Vanadio-oxy-chromium-dravite is rhombohedral, space group $R\bar{3}m$, with the unit-cell parameters $a = 16.1260(2)$, $c = 7.3759(1)$ Å, $V = 1661.11(4)$ Å³, $Z = 3$. Crystal chemistry analysis resulted in the empirical structural formula:



The crystal structure of vanadio-oxy-chromium-dravite was refined to a statistical index $R1$ of 1.16% using 2543 unique reflections collected with $\text{MoK}\alpha$ X-radiation. Ideally, vanadio-oxy-chromium-dravite is related to oxy-chromium-dravite and oxy-vanadium-dravite by the homovalent substitution $\text{V}^{3+} \leftrightarrow \text{Cr}^{3+}$. Tourmaline with chemical compositions classified as vanadio-oxy-chromium-dravite can be either Cr^{3+} -dominant or V^{3+} -dominant as a result of the compositional boundaries along the solid solution between Cr^{3+} and V^{3+} that are determined at $\text{Y}^{+Z}(\text{V}_3\text{Cr}_2)$, corresponding to $\text{Na}^{\text{Y}}(\text{V}_3)^{\text{Z}}(\text{V}_2\text{Cr}_2\text{Mg}_2)\text{Si}_6\text{O}_{18}(\text{BO}_3)_3(\text{OH})_3\text{O}$, and $\text{Y}^{+Z}(\text{V}_{1.5}\text{Cr}_{5.5})$, corresponding to $\text{Na}^{\text{Y}}(\text{V}_{1.5}\text{Cr}_{1.5})^{\text{Z}}(\text{Cr}_4\text{Mg}_2)\text{Si}_6\text{O}_{18}(\text{BO}_3)_3(\text{OH})_3\text{O}$.

Keywords: Vanadio-oxy-chromium-dravite, tourmaline, new mineral species, crystal-structure refinement, electron microprobe, infrared spectroscopy, optical absorption spectroscopy