

## Chromo-alumino-povondraite, $\text{NaCr}_3(\text{Al}_4\text{Mg}_2)(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{O}$ , a new mineral species of the tourmaline supergroup

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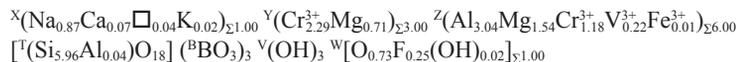
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### ABSTRACT

Chromo-alumino-povondraite,  $\text{NaCr}_3(\text{Al}_4\text{Mg}_2)(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{O}$ , 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 dravite, oxy-chromium-dravite, oxy-dravite, quartz, calcite, chromphyllite, eskolaite, chromite, uvarovite, chromian phlogopite, and pyroxenes of the diopside-kosmochlor series, Cr-bearing tremolite, Cr-bearing titanite, Cr-bearing rutile, and pyrite.

Crystals are green and transparent with a vitreous luster, and exhibit a pale-green streak and conchoidal fracture. Chromo-alumino-povondraite has a Mohs hardness of approximately 7½, and a calculated density of 3.227 g/cm<sup>3</sup>. In plane-polarized light, chromo-alumino-povondraite is pleochroic (*O* = emerald green and *E* = pale yellowish green) and uniaxial negative:  $\omega = 1.745(5)$ ,  $\epsilon = 1.685(5)$ . Chromo-alumino-povondraite is rhombohedral, space group *R3m*, with the unit-cell parameters *a* = 16.0277(2), *c* = 7.3085(1) Å, *V* = 1625.93(5) Å<sup>3</sup>, *Z* = 3. Crystal-chemical analysis resulted in the empirical structural formula:



The crystal structure of chromo-alumino-povondraite was refined to an *R1* index of 1.68% using 1803 unique reflections collected with MoK $\alpha$  X-radiation. Ideally, chromo-alumino-povondraite is related to oxy-dravite and oxy-chromium-dravite by the homovalent substitution  $\text{Cr}^{3+} \leftrightarrow \text{Al}^{3+}$ . Tourmaline with chemical compositions classified as chromo-alumino-povondraite can be either Al-dominant or Cr-dominant as a result of the compositional boundaries along the solid solution between Al and Cr<sup>3+</sup> that are determined at <sup>Y+Z</sup>(Cr<sub>1.5</sub>Al<sub>1.5</sub>), corresponding to Na<sup>Y</sup>(Cr<sub>1.5</sub>Al<sub>1.5</sub>)<sup>Z</sup>(Al<sub>4</sub>Mg<sub>2</sub>)Si<sub>6</sub>O<sub>18</sub>(BO<sub>3</sub>)<sub>3</sub>(OH)<sub>3</sub>O, and <sup>Y+Z</sup>(Cr<sub>3</sub>Al<sub>2</sub>), corresponding to Na<sup>Y</sup>(Cr<sub>3</sub>)<sup>Z</sup>(Cr<sub>2</sub>Al<sub>2</sub>Mg<sub>2</sub>)Si<sub>6</sub>O<sub>18</sub>(BO<sub>3</sub>)<sub>3</sub>(OH)<sub>3</sub>O.

**Keywords:** Chromo-alumino-povondraite, tourmaline, new mineral species, electron microprobe, crystal-structure refinement, infrared spectroscopy, optical absorption spectroscopy, Sludyanka, Russia