

## **Goldschmidtitite, (K,REE,Sr)(Nb,Cr)O<sub>3</sub>: A new perovskite supergroup mineral found in diamond from Koffiefontein, South Africa**

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### **ABSTRACT**

Goldschmidtitite is a new perovskite-group mineral (IMA No. 2018-034) with the ideal formula (K,REE,Sr)(Nb,Cr)O<sub>3</sub>. A single grain of goldschmidtitite with a maximum dimension of ~100 μm was found as an inclusion in a diamond from the Koffiefontein pipe in South Africa. In addition to the dark green and opaque goldschmidtitite, the diamond contained a Cr-rich augite (websteritic paragenesis) and an intergrowth of chromite, Mg-silicate, and unidentified K-Sr-REE-Nb-oxide. Geothermobarometry of the augite indicates that the depth of formation was ~170 km. The chemical composition of goldschmidtitite determined by electron microprobe analysis ( $n = 11$ , WDS, wt%) is: Nb<sub>2</sub>O<sub>5</sub> 44.82, TiO<sub>2</sub> 0.44, ThO<sub>2</sub> 0.10, Al<sub>2</sub>O<sub>3</sub> 0.35, Cr<sub>2</sub>O<sub>3</sub> 7.07, La<sub>2</sub>O<sub>3</sub> 11.85, Ce<sub>2</sub>O<sub>3</sub> 6.18, Fe<sub>2</sub>O<sub>3</sub> 1.96, MgO 0.70, CaO 0.04, SrO 6.67, BaO 6.82, K<sub>2</sub>O 11.53, total 98.53. The empirical formula (expressed to two decimal places) is (K<sub>0.50</sub>La<sub>0.15</sub>Sr<sub>0.13</sub>Ba<sub>0.09</sub>Ce<sub>0.08</sub>)<sub>Σ0.95</sub>(Nb<sub>0.70</sub>Cr<sub>0.19</sub>Fe<sub>0.05</sub>Al<sub>0.01</sub>Mg<sub>0.04</sub>Ti<sub>0.01</sub>)<sub>Σ1.00</sub>O<sub>3</sub>. Goldschmidtitite is cubic, space group  $Pm\bar{3}m$ , with unit-cell parameters:  $a = 3.9876(1) \text{ \AA}$ ,  $V = 63.404(6) \text{ \AA}^3$ ,  $Z = 1$ , resulting in a calculated density of 5.32(3) g/cm<sup>3</sup>. Goldschmidtitite is the K-analog of isolueshite, (Na,La)NbO<sub>3</sub>. Raman spectra of goldschmidtitite exhibit many second-order broad bands at 100 to 700 cm<sup>-1</sup> as well as a pronounced peak at 815 cm<sup>-1</sup>, which is possibly a result of local ordering of Nb and Cr at the B site. The name goldschmidtitite is in honor of the eminent geochemist Victor Moritz Goldschmidt (1888–1947), who formalized perovskite crystal chemistry and identified KNbO<sub>3</sub> as a perovskite-structured compound.

**Keywords:** Perovskite, niobium, mantle, diamond inclusion, new mineral, Koffiefontein, Kaapvaal