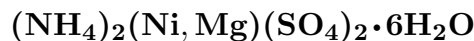


# Nickel-boussingaultite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . As prismatic grains, to < 0.01 mm, in thin films.

**Physical Properties:** *Cleavage:* Imperfect. Hardness = 2.5 D(meas.) = n.d.  
D(calc.) = 1.85 Soluble in  $\text{H}_2\text{O}$ .

**Optical Properties:** Semitransparent. *Color:* Greenish blue to emerald-green; green in transmitted light.

*Optical Class:* Biaxial (+). *Pleochroism:*  $X$  = pale blue;  $Z$  = yellow. *Orientation:*  $X \wedge c = 0^\circ\text{--}4^\circ$ .  $\alpha = 1.490$   $\beta = 1.494$   $\gamma = 1.501$  2V(meas.) = n.d.

**Cell Data:** *Space Group:*  $P2_1/b$  (by analogy to synthetic  $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ ).  
 $a = 9.241(2)$   $b = 12.544(15)$   $c = 6.243(5)$   $\beta = 106^\circ 58(6)'$   $Z = 2$

**X-ray Powder Pattern:** Noril'sk, Russia.

4.153 (10), 3.759 (8), 11.7 (7), 2.119 (7), 3.022 (6), 2.793 (6), 1.806 (6)

## Chemistry:

|                           |          |
|---------------------------|----------|
|                           | (1)      |
| $\text{SO}_3$             | 40.20    |
| FeO                       | 0.37     |
| NiO                       | 16.84    |
| CuO                       | 2.74     |
| MgO                       | 2.30     |
| $\text{Na}_2\text{O}$     | 0.52     |
| $(\text{NH}_4)_2\text{O}$ | [10.40]  |
| $\text{H}_2\text{O}$      | 27.42    |
| Total                     | [100.79] |

(1) Noril'sk, Russia; original total given as 100.89%,  $(\text{NH}_4)^{1+}$  calculated for charge balance, found present by IR; corresponds to  $[(\text{NH}_4)_{1.59}\text{Na}_{0.07}]_{\Sigma=1.66}(\text{Ni}_{0.90}\text{Mg}_{0.23}\text{Cu}_{0.14}\text{Fe}_{0.02})_{\Sigma=1.29}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ .

**Mineral Group:** Picromerite group.

**Occurrence:** In an underground nickel ore stockpile, around and on a wooden timber, and on "limonite" (Noril'sk, Russia).

**Association:** Pentlandite, chalcopyrite, "limonite" (Noril'sk, Russia); wupatkiite, hydrohonessite, pickeringite (Cameron, Arizona, USA).

**Distribution:** From the Talnakh area, Noril'sk, western Siberia, Russia. At the Heimberg quarry, Wolfshagen, Harz Mountains, Germany. In the USA, from a prospect 13 km east-southeast of Gray Mountain, Cameron district, Coconino Co., Arizona.

**Name:** As the *nickel*-bearing analog of *boussingaultite*.

**Type Material:** A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 83553.

**References:** (1) Yakhontova, L.K., G.A. Siderenko, T.I. Stolyarova, I.I. Plyusnina, and T.L. Ivanova (1976) Nickel-containing sulfates from the oxidation zone of the Noril'skiye deposits. Zap. Vses. Mineral. Obshch., 105, 710–720 (in Russian). (2) (1986) Amer. Mineral., 71, 1545 (abs. ref. 1). (3) Montgomery, H. and E.C. Lingafelter (1964) The crystal structure of Tutton's salts. II. Magnesium ammonium sulfate hexahydrate and nickel ammonium sulfate hexahydrate. Acta Cryst., 17, 1478–1479. (4) Pekov, I.V. (1998) Minerals first discovered on the territory of the former Soviet Union. Ocean Pictures, Moscow, 152.

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