

Efremovite



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Crystal Data: Cubic. *Point Group:* 23. As equant grains, to 0.015 mm; typically as crusts.

Physical Properties: *Fracture:* Uneven. Hardness = ~2 D(meas.) = n.d. D(calc.) = 2.52
Readily hygroscopic, altering to boussingaultite.

Optical Properties: Transparent to nearly opaque. *Color:* White, gray; colorless to pale brown in transmitted light. *Luster:* Vitreous.

Optical Class: Isotropic. $n = 1.550(1)$

Cell Data: *Space Group:* $P2_13$. $a = 9.99(1)$ $Z = 4$

X-ray Powder Pattern: Chelyabinsk coal basin, Russia.

3.15 (10), 4.07 (7), 4.33 (6), 2.668 (4), 5.76 (3.5), 3.00 (3.5), 1.620 (2.5)

Chemistry:

	(1)
SO ₃	38.37
FeO	0.72
MnO	0.25
MgO	11.47
CaO	0.35
Na ₂ O	0.13
K ₂ O	0.50
(NH ₄) ₂ O	8.31
insol.	39.97
Total	100.07

(1) Chelyabinsk coal basin, Russia; K by flame photometry, insoluble is organic matter and quartz; corresponds to $[(\text{NH}_4)_{2.00}\text{K}_{0.06}\text{Na}_{0.02}]_{\Sigma=2.08}(\text{Mg}_{1.79}\text{Fe}_{0.06}\text{Ca}_{0.04}\text{Mn}_{0.02})_{\Sigma=1.91}(\text{SO}_4)_{3.00}$.

Occurrence: As crusts on burning coal mine dumps, formed by the reaction of combustion gases with carbonate rocks.

Association: Sulfur, kladnoite, mascagnite, boussingaultite.

Distribution: From near Kopeysk, in the Chelyabinsk coal basin, Southern Ural Mountains, Russia. At the Scholler mine, near Kladno, Czech Republic.

Name: Honors Dr. Ivan Antonovich Yefremov (1907–1972), Russian geologist and science fiction writer.

Type Material: Il'menskii Preserve Museum, Miass, 5895; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia.

References: (1) Shcherbakova, Y.P. and L.F. Bazhenova (1989) Efremovite $(\text{NH}_4)_2\text{Mg}_2(\text{SO}_4)_3$ – ammonium analogue of langbeinite – a new mineral. *Zap. Vses. Mineral. Obshch.*, 118, 84–87 (in Russian). (2) (1991) *Amer. Mineral.*, 76, 299–300 (abs. ref. 1). (3) Pekov, I.V. (1998) Minerals first discovered on the territory of the former Soviet Union. *Ocean Pictures*, Moscow, 78.