Usovite **$Ba_2CaMgAl_2F_{14}$**

Crystal Data: Monoclinic. *Point Group:* $2/m$. Anhedral elongated platy crystals, to 1.5 cm; commonly in irregular grains.

Physical Properties: *Cleavage:* One direction, perfect; another at 44° to the first noted under the microscope. *Fracture:* Irregular. Hardness = 3.5 VHN = 294 D(meas.) = n.d. D(calc.) = [4.26] Diamagnetic.

Optical Properties: Opaque, translucent in thin fragments. *Color:* Brown to dark brown, spotty; yellowish brown in transmitted light. *Streak:* White. *Luster:* Vitreous to greasy. *Optical Class:* Biaxial (+). *Pleochroism:* Weak; $X = Y$ = brownish yellow; Z = pale yellow. *Orientation:* Extinction ∥ perfect cleavage; OAP ⊥ to perfect cleavage. *Absorption:* $X = Y > Z$. $\alpha = 1.441(1)$ $\beta = 1.442(1)$ $\gamma = 1.444(1)$ 2V(meas.) = 70°

Cell Data: *Space Group:* $C2/c$. $a = 13.565(1)$ $b = 5.200(4)$ $c = 14.557(10)$ $\beta = 91°50(4)'$ Z = 4

X-ray Powder Pattern: Pravaya Noiby River, Russia.
3.41 (10), 1.205 (9), 1.025 (9), 1.132 (8), 1.093 (8), 1.012 (8), 1.005 (8)

Chemistry:

	(1)	(2)
SiO_2	1.40	
Al_2O_3	16.06	15.47
MgO	6.06	6.12
CaO	8.40	8.51
SrO	0.35	
BaO	44.04	46.54
Na_2O	0.20	
K_2O	0.05	
F	39.80	40.36
H_2O^+	0.34	
H_2O^-	0.12	
SO_3	0.21	
$-O = F_2$	16.72	17.00
Total	100.31	100.00

(1) Pravaya Noiby River, Russia; contaminated with estimated fluorite 11.7%.
(2) $Ba_2CaMgAl_2F_{14}$.

Occurrence: In a fluorite vein in quartz-mica schists.

Association: Fluorite, calcjarlite, muscovite, thorite, chamosite, zeolites, halloysite.

Distribution: From the issue of the second tributary of the Pravaya Noiby River, left tributary to the Teya River, Yenisei Ridge, Siberia, Russia.

Name: Honors Academician Mikhail Antonovich Usov (1883–1939), geologist, Karpinskii All-Union Research Institute of Geology, St. Petersburg, Russia.

Type Material: Tomsk Polytechnic Institute, Tomsk; Central Siberian Geological Museum, Novosibirsk, VI-15/1; Mining Institute, St. Petersburg, 1089/1; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 69852, 76161, vis1194.

References: (1) Nozhkin, A.D., V.A. Gavrilenko, and A.V. Moleva (1967) Usovite, a new barium fluoaluminate. Zap. Vses. Mineral. Obshch., 96, 63–66 (in Russian). (2) (1967) Amer. Mineral., 52, 1582 (abs. ref. 1). (3) Povarennykh, A.S., L.M. Egorova, A.L. Litvin, and A.D. Nozhkin (1974) The chemical composition and unit cell of usovite. Dokl. Akad. Nauk Ukr. RSR, Ser. B, 36(10), 891–893 (in Ukrainian with English abs.). (4) Litvin, A.L., A.A. Petrunina, S.S. Ostapenko, and A.S. Povarennykh (1980) The crystal structure of usovit. Dokl. Akad. Nauk Ukr. RSR, Ser. B, 3, 47–50 (in Ukrainian with English abs.).