Beusite $(Mn^{2+}, Fe^{2+}, Ca, Mg)_3(PO_4)_2$

Crystal Data: Monoclinic. *Point Group:* $2/m$. As rough prismatic crystals, to 30 cm; usually in laminated or granular intergrowths with lithiophilite, perhaps by exsolution.

Physical Properties: *Cleavage:* Good on {010}; fair on {100}. Hardness = 5
D(meas.) = 3.60–3.70 D(calc.) = [3.60]

Optical Properties: Translucent. *Color:* Pale reddish brown. *Streak:* Pale pink or brown. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Orientation:* $X = b$; $Z \wedge c = -36°$. *Dispersion:* $r > v$, strong.
$\alpha = 1.685–1.708$ $\beta = 1.688–1.711$ $\gamma = 1.700–1.723$ 2V(meas.) = 25°–45°

Cell Data: *Space Group:* $P2_1/c$. $a = 8.797(3)$ $b = 11.758(4)$ $c = 6.170(2)$
$\beta = 99.31(2)°$ Z = 4

X-ray Powder Pattern: Los Aleros pegmatite, Argentina.
3.49 (100b), 2.863 (100b), 2.708 (60), 3.13 (40), 1.926 (40b), 3.01 (35), 2.89 (30)

Chemistry:

	(1)	(2)		(1)	(2)
P_2O_5	40.2	41.6	CaO	4.64	16.1
SiO_2	1.5		Li_2O	0.14	
FeO	14.2	19.8	H_2O^+	0.8	
MnO	35.5	23.1	H_2O^-	0.17	
MgO	2.56	0.0	Total	99.71	100.6

(1) Los Aleros pegmatite, Argentina; after deduction of SiO_2, Li_2O, and H_2O as impurities, corresponds to $(Mn_{1.77}Fe_{0.70}Ca_{0.29}Mg_{0.22})_{\Sigma=2.98}(PO_4)_2$. (2) Yellowknife district, Canada; by electron microprobe, total Fe as FeO, total Mn as MnO; corresponds to $(Mn_{1.10}Ca_{0.98}Fe_{0.94})_{\Sigma=3.02}(PO_4)_{1.99}$.

Polymorphism & Series: Forms a series with graftonite.

Occurrence: A late-stage accessory mineral in complex granite pegmatites. As euhedral inclusions in troilite nodules in an iron meteorite.

Association: Lithiophilite or triphylite (pegmatites); troilite, sarcopside (iron meteorite).

Distribution: In Argentina, large crystals from the Los Aleros pegmatite, and at the Amanda and San Salvador pegmatites, San Luis Province. In Canada, near upper Ross Lake, Yellowknife district, Northwest Territories, and at the Gotcha claim, on an island in Cross Lake, Manitoba. In the USA, in the Storm Mountain and Crystal Snow pegmatites, Crystal Mountain district, Larimer Co., Colorado. From the Eräjärvi area, Orivesi, Finland. At the Tsaobismund pegmatite, 60 km south of Karibib, Namibia. From Kyrk-Bulak, Turkestan Range, Kirgizia. In the El Sampal type IIIA iron meteorite.

Name: Honors Dr. Alexey Alexandrovich Beus, Professor of Mineralogy and Geochemistry, Moscow Polytechnical Institute, for his work on minerals of this group.

Type Material: Harvard University, Cambridge, Massachusetts, 109052, 134312, 134313; National Museum of Natural History, Washington, D.C., USA, 137294.

References: (1) Hurlbut, C.S., Jr. and L.F. Aristarain (1968) Beusite, a new mineral from Argentina, and the graftonite–beusite series. Amer. Mineral., 53, 1799–1814. (2) Wise, M.A. and P. Černý (1990) Beusite-triphylite intergrowths from the Yellowknife pegmatite field, Northwest Territories. Can. Mineral., 28, 133–139. (3) Wise, M.A., F.C. Hawthorne, and P. Černý (1990) Crystal structure of Ca-rich beusite from the Yellowknife pegmatite field, Northwest Territories. Can. Mineral., 28, 141–146. (4) Steele, I.M., E. Olsen, J. Pluth, and A.M. Davis (1991) Occurrence and crystal structure of Ca-free beusite in the El Sampal IIIA iron meteorite. Amer. Mineral., 76, 1985–1989.