## Kampelite $Ba_3Mg_{1.5}Sc_4(PO_4)_6(OH)_3 \cdot 4H_2O$

**Crystal Data**: Orthorhombic. *Point group*: 2/*m* 2/*m* 2/*m*. As radial aggregates, to 1.5 mm, of split plates (to 700 $\mu$m) elongated along [010] and flattened on {010}.

**Physical Properties**: *Cleavage*: Perfect on {001}. *Tenacity*: Flexible. *Fracture*: Smooth. Hardness = ~1 VHN = n.d. D(meas.) = 3.07(3) D(calc.) = 3.28 Dissolves in 10% HCl.

**Optical Properties**: Translucent. *Color*: Colorless. *Streak*: White. *Luster*: Pearly. *Optical Class*: Biaxial (+) (pseudo-uniaxial). $\alpha \approx \beta = 1.607(2)$ $\gamma = 1.612(2)$ 2V(calc.) = 0°

**Cell Data**: *Space Group: Pnma*. $a = 11.2261(9)$ $b = 8.5039(6)$ $c = 27.699(2)$ Z = 4

**X-ray Powder Pattern**: Iron open pit, Kovdor massif, Murmansk Region, Russia.
15.80 (100), 13.86 (45), 2.688 (24), 3.129 (19), 3.184 (18), 2.756 (16), 3.022 (14)

**Chemistry**:

| | (1) | (2) |
|---|---|---|
| MgO | 4.79 | 4.61 |
| $Al_2O_3$ | 0.45 | |
| $P_2O_5$ | 31.66 | 32.45 |
| $K_2O$ | 0.34 | |
| CaO | 0.34 | |
| $Sc_2O_3$ | 16.17 | 21.02 |
| MnO | 1.46 | |
| FeO | 1.24 | |
| SrO | 3.44 | |
| BaO | 29.81 | 35.06 |
| $H_2O$ | [7.12] | 6.87 |
| Total | 97.03 | 100.00 |

(1) Iron open pit, Kovdor massif, Murmansk Region, Russia; average of 3 electron microprobe analyses, $H_2O$ calculated from structure; corresponds to $(Ba_{2.62}Sr_{0.45}K_{0.10}Ca_{0.06})_{\Sigma=3.23}Mg_{1.60}Mn_{0.28}(Sc_{3.15}Fe^{3+}_{0.23}Al_{0.12})_{\Sigma=3.50}(PO_4)_6(OH)_{2.61} \cdot 4.01H_2O$. (2) $Ba_3Mg_{1.5}Sc_4(PO_4)_6(OH)_3 \cdot 4H_2O$.

**Occurrence**: A product of low-temperature hydrothermal alteration of Sc-bearing baddeleyite. In a void within the calcite-magnetite phoscorite (enriched in hydroxylapatite and Sc-rich baddeleyite) in the axial zone of a phoscorite-carbonatite pipe.

**Association**: Quintinite-2*H*, pyrite, bobierrite, quintinite-3*R*.

**Distribution**: From the Iron open pit, Kovdor massif, Murmansk Region, Russia.

**Name**: Honors Russian mining engineer Felix Borisovich Kampel' (b. 1935) for his contribution to the technologies for mining and processing the complex magnetite-apatite-baddeleyite ores of the Kovdor deposit.

**Type Material**: Mineralogical Museum, St. Petersburg State University, Russia (1/19660).

**References**: (1) Yakovenchuk, V.N., G.Yu. Ivanyuk, Y.A. Pakhomovsky, T.L. Panikorovskii, S.N. Britvin, S.V. Krivovichev, V.V. Shilovskikh, and V.N. Bocharov (2018) Kampelite, $Ba_3Mg_{1.5}Sc_4(PO_4)_6(OH)_3 \cdot 4H_2O$, a new very complex Ba-Sc phosphate mineral from the Kovdor phoscorite-carbonatite complex (Kola Peninsula, Russia). Mineral. Petrol., 112(1), 111-121.
(2) (2018) Amer. Mineral., 103, 2043 (abs. ref. 1).