Ushkovite

MgFe\(_{2}^{3+}\)(PO\(_{4}\))\(_{2}\)(OH)\(_{2}\)\(\cdot\)8H\(_{2}O\)

Crystal Data: Triclinic. Point Group: \(\bar{T}\) or 1. As crystals, typically equant to short prismatic along [001], may be flattened on [001], showing prominent {001}, {010}, {1\bar{1}0}, minor {100}, {110}, {210}, {0\bar{1}1}, to 2 mm; in radiating fibrous aggregates. Twinning: On {hk0}.

Physical Properties: Cleavage: Perfect on {010}. Tenacity: Very brittle. Hardness = 3.5

Physical Properties: D(meas.) = 2.38 D(calc.) = 2.40


Optical Class: Biaxial (−). Orientation: \(Y \wedge c = 26^\circ\); X and Y nearly in {010}.

Dispersion: \(r>v\), strong. \(\alpha = 1.584(2)\) \(\beta = 1.637(2)\) \(\gamma = 1.670(2)\) \(2V(meas.) = 50^\circ\)

Cell Data: Space Group: \(\overline{P}T\) or \(\overline{P}1\). \(a = 5.196(9)\) \(b = 10.70(2)\) \(c = 7.14(2)\)

\(\alpha = 108.6(1)^\circ\) \(\beta = 106.95(5)^\circ\) \(\gamma = 72.70(5)^\circ\) \(Z = 1\)

X-ray Powder Pattern: Ilmen Mountains, Russia; close to laueite.

9.86 (100), 6.57 (80), 3.20 (80), 3.28 (60), 4.95 (50), 4.85 (50), 4.01 (40)

Chemistry:

\[
\begin{array}{ccc}
\text{P}O_5 & 30.47 & 28.2 \\
\text{Al}_2O_3 & 0.00 & 0.1 \\
\text{Fe}_2O_3 & 29.87 & 31.8 \\
\text{FeO} & 0.00 & \\
\text{MnO} & 1.88 & 0.2 \\
\text{MgO} & 8.79 & 8.1 \\
\text{CaO} & 2.54 & \\
\text{H}_2O^+ & 14.83 & \\
\text{H}_2O^- & 12.28 & \\
\text{H}_2O & [31.6] & 32.16 \\
\text{Total} & 100.66 & 100.00
\end{array}
\]

(1) Ilmen Mountains, Russia; part of H\(_2\)O thought lost during sample preparation; after deduction of Ca and some P as francolite, and Mn as Mn oxide, corresponds to Mg\(_{1.15}\)Fe\(_{1.98}\) (PO\(_4\))\(_{2.12}\)(OH)\(_2\)\(\cdot\)7H\(_2\)O. (2) Hagendorf, Germany; by electron microprobe, total Fe as Fe\(_2O_3\), H\(_2\)O by difference; corresponds to (Mg\(_{1.0}\)Mn\(_{0.01}\))\(_{\Sigma=1.02}\)(Fe\(_{2.06}\)Al\(_{0.01}\))\(_{\Sigma=2.01}\)(PO\(_4\))\(_{2.00}\)(OH)\(_2\)\(\cdot\)8H\(_2\)O. (3) MgFe\(_2\)(PO\(_4\))\(_{2}\)(OH)\(_2\)\(\cdot\)8H\(_2\)O.

Mineral Group: Paravauxite group.

Occurrence: In granite pegmatites, as an alteration product of triplite formed by weathering.

Association: Triplite, francolite, mitridatite, beraunite, Fe–Mn oxides (Ilmen Mountains, Russia).

Distribution: On the southern shore of Lake Bol’shoy Tatkul’, Il’men Mountains, Southern Ural Mountains, Russia. In the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire; at the Dunton quarry, Newry, Oxford Co., Maine, USA. From the Sandamap pegmatite, west of Usakos, Namibia. At Boa Vista, near Galliéa, Minas Gerais, Brazil.

Name: To honor Sergei L’vovich Ushkov (1880–1951), Russian naturalist, student of the Il’men National Forest, Russia.

Type Material: Il’menskii Preserve Museum, Miass, iz4523; Mining Institute, St. Petersburg, 1293/1; Vernadsky Geological Museum, Moscow, 53492; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 82364.