American Mineralogist, Volume 95, pages 392–396, 2010

Galliskiite, $Ca_4Al_2(PO_4)_2F_8 \cdot 5H_2O$, a new mineral from the Gigante granitic pegmatite, Córdoba province, Argentina

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Abstract

Galliskiite, ideally $Ca_4Al_2(PO_4)_2F_8 \cdot 5H_2O$, is a new mineral found at the Gigante granitic pegmatite, Punilla department, Córdoba Province, Argentina. It is named for Argentine mineralogist and pegmatite specialist Miguel Ángel Galliski. Galliskiite is triclinic, $P\bar{1}$, $a = 6.1933(7)$, $b = 9.871(1)$, $c = 13.580(2)$ Å, $\alpha = 89.716(3)$, $\beta = 75.303(4)$, $\gamma = 88.683(4)°$, $Z = 2$. The strongest lines in the X-ray powder diffraction pattern are [*d* in Å, (*I*)]: 7.904 (70), 5.994 (100), 3.280 (58), 3.113 (30), 2.945 (85), 2.887 (44), 2.483 (20), 2.262 (27), 2.150 (23), 1.821 (27), and 1.798 (25). It occurs as crude platy crystals elongated along [001] and flattened on {010}, with frosty surfaces. Simple contact and polysynthetic twinning on {100} by rotation about [010] is ubiquitous. It is colorless and transparent, has white streak and vitreous luster, and is nonfluorescent under ultraviolet radiation. It has a Mohs hardness of 2½, conchoidal to irregular fracture and two fair cleavages at approximately 90°. The measured density is 2.67(3) g/cm^3, and the calculated density is 2.670 g/cm^3. Galliskiite dissolves slowly in concentrated HCl. The mineral is biaxial (+), $\alpha = 1.493(1)$, $\beta = 1.495(1)$, $\gamma = 1.520(1)$, $2V_{meas} = 33(5)°$, $2V_{calc} = 32°$; dispersion, $r < v$; orientation $Z \approx \mathbf{b}$, X and Z at 40–50° from **a** and **c**. No pleochroism is observed. Analysis by electron microprobe (average of 12 analyses given in wt%) provided CaO 34.71, MgO 0.01, FeO 0.10, MnO 0.17, Al_2O_3 15.92, SiO_2 0.06, TiO_2 0.01, P_2O_5 21.94, F 21.35, H_2O (calculated by stoichiometry) 15.08, less F≡O 8.99, total 100.39 wt%. The empirical formula, based on 21 (F+O), is $(Ca_{3.98}Mn_{0.02}Fe_{0.01})_{\Sigma 4.0}Al_{2.01}(P_{1.99}Si_{0.01}O_8)F_{7.23}(OH)_{0.77} \cdot 5H_2O$. The crystal structure, solved and refined using single-crystal data to $R_1 = 0.033$, consists of double chains of alternating corner-sharing AlF_3O_3 octahedra and PO_4 tetrahedra along the **a** axis. The chains are joined into a framework via bonds to four distinct Ca atoms. Calcium atoms are also linked by sharing isolated F atoms and H_2O molecules. The double-chain motif in the structure of galliskiite is distinct from that in any other known phosphate.

Keywords: Galliskiite, new mineral, pegmatite phosphate, Córdoba, Argentina