Drugmanite $HPb_2(Fe^{3+}, Al)(PO_4)_2(OH)_2$

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Crystal Data: Monoclinic, pseudo-orthorhombic. *Point Group:* $2/m$. Pseudorhombohedral crystals, to 0.2 mm, with prominent {001}, also {110}, flattened on [001], elongated along [010], in aggregates.

Physical Properties: Hardness = < 6 D(meas.) = > 4.1 D(calc.) = 5.55

Optical Properties: Transparent. *Color:* Pale yellow to colorless; in transmitted light, colorless with anomalous interference colors. *Streak:* White. *Luster:* Adamantine. *Optical Class:* Biaxial (–). *Orientation:* OAP = (010); $X \simeq \perp$ (001). *Dispersion:* $r < v$, strong. $n = [1.87]$ $\alpha = > 1.74$ $\beta = > 1.74$ $\gamma = > 1.74$; γ–$\beta = 0.020(2)$ in (001) section. 2V(meas.) = 33(2)°

Cell Data: *Space Group:* $P2_1/a$. $a = 11.111(5)$ $b = 7.986(5)$ $c = 4.643(3)$ $\beta = 90.41(3)°$ Z = 2

X-ray Powder Pattern: Richelle, Belgium.
3.752 (10), 4.63 (9), 2.912 (9), 3.350 (8), 3.247 (8), 2.714 (7b), 2.391 (6)

Chemistry:

	(1)	(2)
P_2O_5	20.37	20.85
Al_2O_3	1.61	3.74
Fe_2O_3	8.85	5.87
PbO	64.37	65.57
H_2O	[3.87]	3.97
Total	[99.07]	100.00

(1) Richelle, Belgium; by electron microprobe, average of eight analyses; total Fe as Fe_2O_3, H_2O calculated for 10 O^{2-}; corresponds to $HPb_2(Fe_{0.78}Al_{0.22})_{\Sigma=1.00}(PO_4)_2(OH)_2$.
(2) $HPb_2(Fe, Al)(PO_4)_2(OH)_2$ with Fe:Al = 1:1.

Occurrence: Very rare, formed at low temperatures in vugs in mineralized limestones, an oxidation product of disseminated sulfides.

Association: Anglesite, corkite, pyromorphite, phosphosiderite.

Distribution: From Richelle, near Visé, Belgium.

Name: To honor Dr. Julien Drugman (1875–1950), Belgian mineralogist.

Type Material: Belgian Royal Institute of Natural Sciences, Brussels, RC5210; University of Liège, Liège, Belgium, 19347.

References: (1) van Tassel, R., A.-M. Fransolet, and K. Abraham (1979) Drugmanite, $Pb_2(Fe^{3+}, Al)(PO_4)_2(OH) \cdot H_2O$, a new mineral from Richelle, Belgium. Mineral. Mag., 43, 463–467. (2) (1980) Amer. Mineral., 65, 809 (abs. ref. 1). (3) King, G.S.D. and L. Sengier-Roberts (1988) Drugmanite, $Pb_2(Fe_{0.78}Al_{0.22})H(PO_4)_2(OH)_2$: its crystal structure and place in the datolite group. Bull. Minéral., 111, 431–437.

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