Iangreyite $Ca_2Al_7(PO_4)_2(PO_3OH)_2(OH,F)_{15}\cdot 8H_2O$

Crystal Data: Hexagonal. *Point Group:* 32. As hexagonal tablets (sometimes warped), to 0.4 mm, exhibiting forms {001} and {100}; in subparallel stacked aggregates.

Physical Properties: *Cleavage:* Perfect, {001}. *Fracture:* Irregular. *Tenacity:* Brittle; somewhat flexible. Hardness = 3 D(meas.) = 2.46(3) D(calc.) = 2.451

Optical Properties: Transparent to translucent. *Color:* Colorless to white or cream, white, yellowish, or light pink. *Streak:* White.
Luster: Vitreous, pearly (aggregates).
Optical Class: Uniaxial (+). ω = 1.544(2) ε = 1.554(2)

Cell Data: *Space Group: P*321. a = 6.988(1) c = 16.707(3) Z = 1

X-ray Powder Pattern: Silver Coin mine, Nevada, USA.
16.739 (100), 2.967 (45), 2.219 (19), 6.054 (18), 1.744 (17), 5.687 (13), 1.896 (13)

Chemistry:	(1)	(2)		(1)	(2)
Na_2O	0.27	0.04	ZnO	0.10	0.05
K_2O	1.01	0.45	Al_2O_3	31.80	29.55
CaO	7.62	11.28	SiO_2	0.19	2.42
FeO	0.16	0.82	As_2O_5	0.00	0.04
BaO	0.45	0.26	P_2O_5	25.90	24.05
SrO	0.10	1.13	SO_3	0.40	0.05
MgO	0.34	0.04	F	9.53	8.23
PbO	0.00	0.04	- O = F	2.81	3.46
CuO	0.06	0.06	$H_2O_{diff.}$	24.87	24.96
MnO	0.00	0.00	Total	100.00	100.00

(1) Silver Coin mine, Nevada, USA; average of 7 electron microprobe analyses, H_2O by difference, presence of H_2O, OH, and PO_4 confirmed by IR and Raman spectroscopy; corresponding to $Ca_{1.42}K_{0.22}Na_{0.09}Ba_{0.03}Sr_{0.01}Al_{6.51}Mg_{0.09}Fe_{0.02}Cu_{0.01}Zn_{0.01}P_{3.81}F_{5.24}\ H_{30.21}O_{33.76}$.
(2) Krásno ore district, Horní Slavkov, Czech Republic; average of 12 electron microprobe analyses, corresponding to $Ca_{2.15}K_{0.10}Na_{0.01}Ba_{0.02}Sr_{0.12}Al_{6.28}\ Mg_{0.01}Fe_{0.12}Cu_{0.08}\ Zn_{0.01}P_{3.64}Si_{0.43}F_{4.65}H_{29.62}O_{34.35}$.

Occurrence: A weathering product derived from the breakdown of phosphate minerals (e.g. F-rich perhamite, "fluorapatite") by acidic ground waters derived from the oxidation of sulfide minerals.

Association: Meurigite-Na, plumbogummite, kidwellite, lipscombite, strengite, chalcosiderite, wardite, leucophosphite, wavellite, goethite, barite, quartz, and F-rich perhamite (Silver Coin mine, Nevada, USA); "fluorapatite" (Czech Republic).

Distribution: From the Silver Coin mine, Valmy, Iron Point district, Humboldt County, Nevada, USA; at the 5th level of the Huber shaft, Krásno ore district, near Horní Slavkov, Czech Republic.

Name: Honors Dr. Ian Edward Grey (b. 1944), formerly Chief Research Scientist at CSIRO Minerals, Melbourne, Australia, for his contributions to mineralogy, crystallography and the minerals-processing industry.

Type Material: Mineral Sciences Department, Natural History Museum of Los Angeles County, California, USA (57661 and 62519); Department of Mineralogy and Petrology, National Museum Prague, Czech Republic (P1P 20/2009).

References: (1) Mills, S.J., A.R. Kampf, J. Sejkora, P.M. Adams, W.D. Birch, and J. Plášil (2011) Iangreyite: a new secondary phosphate mineral closely related to perhamite. Mineral. Magazine, 75, 327-336. (2) (2013) Amer. Mineral., 98, 280 (abs. ref. 1).