Phosphovanadylite-Ca

\[ \text{Ca}[\text{V}^{4+}_4\text{P}_2\text{O}_8\text{(OH)}_8]\cdot12\text{H}_2\text{O} \]

Crystal Data: Cubic.  
Point Group: 4 \( \bar{3} \)m.  
As cubes to 0.1 mm, in crusts.  
Twinning: Penetration twins on \{111\} common.

Physical Properties: Cleavage: None.  
Fracture: Irregular.  
Tenacity: Brittle.  
Hardness = 2

D(meas.) = 2.02(3)  
D(calc.) = 2.038  
Gradually turns black on exposure to sunlight.

Optical Properties: Semitransparent.  
Color: Bright greenish blue.  
Streak: Very pale greenish blue.  
Luster: Vitreous.  
Optical Class: Isotropic.  
\( n = 1.559(2) \)

Cell Data: Space Group: \( \text{I} \bar{4} \text{3m} \).  
\( a = 15.441(1) \)  
\( Z = 6 \)

X-ray Powder Pattern:  
South Rasmussen mine, Soda Springs, Caribou County, Idaho, USA.  
7.7881 (100), 11.04 (97), 3.1706 (46), 2.749 (32), 1.8295 (16), 2.3426 (15), 4.487 (14)

Chemistry:

\[
\begin{array}{ccc}
\text{Na}_2\text{O} & 0.22 & 0.22 \\
\text{K}_2\text{O} & 0.55 & 0.55 \\
\text{CaO} & 5.58 & 6.86 \\
\text{SrO} & 0.10 & 0.10 \\
\text{BaO} & 0.21 & 0.21 \\
\text{Al}_2\text{O}_3 & 3.27 & 3.27 \\
\text{VO}_2 & 35.85 & 40.56 \\
\text{P}_2\text{O}_5 & 18.78 & 17.35 \\
\text{H}_2\text{O} & 35.44 & 35.24 \\
\text{Total} & 100.00 & 100.00 \\
\end{array}
\]

(1) South Rasmussen mine, Soda Springs, Caribou County, Idaho, USA; average of 18 electron microprobe analyses supplemented by CHN analyzer; corresponding to \((\text{Ca}_0.75\text{K}_0.09\text{Na}_0.05\text{Ba}_0.01\text{Sr}_0.01)\Sigma=0.91[(\text{V}^{4+}_{3.27}\text{Al}_{0.49})\Sigma=3.76\text{P}_2\text{O}_5\text{(OH)}_{5.77}]\cdot12\text{H}_2\text{O}.  
(2) \text{Ca}[\text{V}^{4+}_4\text{P}_2\text{O}_8\text{(OH)}_8]\cdot12\text{H}_2\text{O}.

Occurrence: Crystallized at ambient temperatures from late-stage aqueous solutions of near neutral pH under relatively reducing conditions in phosphatic black mudstone.

Association: Quartz, fluorapatite, hydroxylapatite, pyrite, sphalerite, sincosite, native Se.

Distribution: From the South Rasmussen (or South Rasmussen Ridge) phosphate mine, Soda Springs, Caribou County, Idaho, USA.

Name: As the Ca analog of phosphovanadylite, which is now renamed as phosphovanadylite-Ba.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA. (63578, 63579, 63580, 63581, and 63582).

References: (1) Kampf, A.R., B.P. Nash, and T.A. Loomis (2013) Phosphovanadylite-Ca, \text{Ca}[\text{V}^{4+}_4\text{P}_2\text{O}_8\text{(OH)}_8]\cdot12\text{H}_2\text{O}, the Ca analogue of phosphovanadylite-Ba. Amer. Mineral., 98, 439-443.