Abernathyite $K_2(UO_2)_2(AsO_4)_2 \cdot 6H_2O$

Crystal Data: Tetragonal. *Point Group:* $4/m\ 2/m\ 2/m$. As thick tabular crystals, composed of {001} and {110}, to 3 mm.

Physical Properties: *Cleavage:* Perfect on {001}. *Tenacity:* Brittle. Hardness = 2–3 D(meas.) = > 3.32 D(calc.) = 3.572 Fluoresces yellow-green under LW and SW UV. Radioactive.

Optical Properties: Transparent. *Color:* Yellow. *Streak:* Pale yellow. *Luster:* Weakly vitreous.
Optical Class: Uniaxial (–), anomalously biaxial (–). *Pleochroism:* O = yellow; E = pale yellow to colorless. $\omega = 1.597$–1.608 $\epsilon = 1.570(3)$ 2V(meas.) = ∼5°

Cell Data: *Space Group:* $P4/ncc$. a = 7.176(8) $c = 18.126(10)$ Z = 4

X-ray Powder Pattern: Fuemrole No. 2 mine, Utah, USA.
9.14 (10b), 3.84 (8b), 3.34 (8), 5.63 (7), 3.59 (7), 2.79 (6b), 2.28 (6)

Chemistry:

	(1)	(2)
UO_3	57.7	56.97
P_2O_5	1.5	
As_2O_5	21.6	22.89
K_2O	9.5	9.38
H_2O^+	9.9	
H_2O^-	4.6	
H_2O		10.76
Total	104.8	100.00

(1) Fuemrole No. 2 mine, Utah, USA; microchemical analysis, H_2O^+ by loss on ignition; corresponds to $K_{1.94}(UO_2)_{1.92}[(As_{1.79}P_{0.21})_{\Sigma=2.00}O_4] \cdot 7.68H_2O$. (2) $K_2(UO_2)_2(AsO_4)_2 \cdot 6H_2O$; $6H_2O$ assigned from crystal-structure analysis.

Mineral Group: Meta-autunite group.

Occurrence: A rare secondary mineral coating fractures in bleached asphaltic sandstone hosting a Colorado Plateau-type uranium deposit (Fuemrol No. 2 mine, Utah, USA).

Association: Scorodite, zeunerite, heinrichite.

Distribution: In the USA, found at the Fuemrole No. 2 mine, Temple Mountain, Emery Co., Utah; from Cave Hills and Slim Buttes, Harding Co., South Dakota; at the West mine, Saguache Co. and the Clyde Long property, San Juan Co., Colorado; from near Tuba City, Coconino Co., Arizona. In the Riviéral mine, Lodève, Hérault, France. At Sailauf, northeast of Aschaffenburg, Bavaria, Germany.

Name: To honor Jess Abernathy, Moab, Utah, USA, mine owner who found the first specimens.

Type Material: National Museum of Natural History, Washington, D.C., USA, 112650.

References: (1) Thompson, M.E., B. Ingram and E.B. Gross (1956) Abernathyite, a new uranium mineral of the metatorbernite group. Amer. Mineral., 41, 82–90. (2) Frondel, C. (1958) Systematic mineralogy of uranium and thorium. U.S. Geol. Surv. Bull. 1064, 220–222. (3) Ross, M. and H.T. Evans, Jr. (1964) Studies of the torbernite minerals (I): The crystal structure of abernathyite and the structurally related compounds $NH_4(UO_2AsO_4) \cdot 3H_2O$ and $K(H_3O)(UO_2AsO_4)_2 \cdot 6H_2O$. Amer. Mineral., 49, 1578–1602.