Khademite $Al(SO_4)F \cdot 5H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals exhibit large {010}, {001}, modified by {101}, {110}, {111}, {313}, to 1 mm; may form thick crusts.

Physical Properties: Hardness = n.d. D(meas.) = 1.925 D(calc.) = 1.942

Optical Properties: Transparent. *Color:* Colorless.
Optical Class: Biaxial (–). *Orientation:* $X = c$; $Y = b$; $Z = a$. $\alpha = [1.44]$ $\beta = 1.460$ $\gamma = 1.487$ 2V(meas.) = 68(1)°

Cell Data: *Space Group: Pcab.* $a = 11.181(4)$ $b = 13.048(5)$ $c = 10.885(4)$ Z = 8

X-ray Powder Pattern: Saghand, Iran.
4.247 (100), 4.179 (71), 2.730 (59), 3.901 (52), 2.030 (21), 3.351 (16), 2.741 (16)

Chemistry:

	(1)	(2)	(3)
SO_3	35.2		34.64
Al_2O_3	21.6	23.06	22.06
F	n.d.	5.53	4.11
H_2O	41.7		40.92
$-O = F_2$			1.73
Total	98.5		100.00

(1) Saghand, Iran; SO_3 and H_2O by TGA, corresponding to $Al_{1.00}(SO_4)_{1.04}(OH)_{0.92} \cdot 4.99H_2O$; however crystal-structure analysis obviates the presence of $(OH)^{1-}$. (2) Lone Pine mine, New Mexico, USA; partial analysis, Al_2O_3 calculated from Al 8.3%. (3) $Al(SO_4)(F, OH) \cdot 5H_2O$ with F:OH = 1:1.

Occurrence: Rarely formed in the oxidized zone of hydrothermal base-metal deposits.

Association: Copiapite, amarantite, parabutlerite, butlerite, jarosite (Saghand, Iran); wilcoxite, lannonite, gypsum (Lone Pine mine, New Mexico, USA).

Distribution: From Saghand, Yazd, Iran. At the Rammelsberg mine, near Goslar, Harz Mountains, Germany. In the Cetine mine, 20 km southwest of Siena, Tuscany, Italy. From the Schoeller mine, Libušin, near Kladno, Czech Republic. In the Lone Pine mine, Wilcox district, near Silver City, Catron Co., New Mexico, USA.

Name: To honor Nasrollah Khadem (1910–), Director of the Geological Survey of Iran.

Type Material: n.d.

References: (1) Bariand, P., J.-P. Berthelon, F. Cesbron, and M. Sadrzadeh (1973) Un nouveau sulfate hydraté d'aluminium: la khademite de Saghand (Iran). Compt. Rendus Acad. Sci. Paris, 277D, 1585–1588 (in French). (2) Bachet, B., F. Cesbron, and R. Chevalier (1981) Structure cristalline de la khadémite $Al(SO_4)F \cdot 5H_2O$. Bull. Minéral., 104, 19–22 (in French with English abs.). (3) Williams, S.A. and F.P. Cesbron (1983) Wilcoxite and lannonite, two new fluosulphates from Catron Co., New Mexico. Mineral. Mag., 47, 37–40. (4) Cesbron, F. and P. Bayliss (1988) Mineral nomenclature: khademite. Mineral. Mag., 52, 133–134.