

**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:*  $X = c$ ;  $Y = b$ ;  $Z = a$ .  $\alpha = [1.44]$   $\beta = 1.460$

$\gamma = 1.487$   $2V(\text{meas.}) = 68(1)^\circ$

**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 <sub>3</sub>                | 35.2 |       | 34.64  |
| Al <sub>2</sub> O <sub>3</sub> | 21.6 | 23.06 | 22.06  |
| F                              | n.d. | 5.53  | 4.11   |
| H <sub>2</sub> O               | 41.7 |       | 40.92  |
| -O = F <sub>2</sub>            |      |       | 1.73   |
| Total                          | 98.5 |       | 100.00 |

(1) Saghand, Iran; SO<sub>3</sub> and H<sub>2</sub>O by TGA, corresponding to Al<sub>1.00</sub>(SO<sub>4</sub>)<sub>1.04</sub>(OH)<sub>0.92</sub>·4.99H<sub>2</sub>O; however crystal-structure analysis obviates the presence of (OH)<sup>1-</sup>. (2) Lone Pine mine, New Mexico, USA; partial analysis, Al<sub>2</sub>O<sub>3</sub> calculated from Al 8.3%. (3) Al(SO<sub>4</sub>)(F, OH)·5H<sub>2</sub>O 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, Libušín, 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 khadémitte Al(SO<sub>4</sub>)F·5H<sub>2</sub>O. *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.