

**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Crystals bladed, flat tabular on {10 $\bar{1}$ }, elongated along [010], to 1 mm, with forms {100}, {010}, {001}, {10 $\bar{1}$ }, {011}, {11 $\bar{1}$ }, and {121}.

*Twinning:* Common, by rotation about [010] with composition plane {100}.

**Physical Properties:** *Cleavage:* Perfect on {100}, good on {010}. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness =  $\sim$ 2.5 D(meas.) = 5.36(2) D(calc.) = 5.43

**Optical Properties:** Semitransparent. *Color:* Colorless. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (-). *Orientation:*  $X \wedge c = 10^\circ$ ;  $Y \wedge a = 42^\circ$ ;  $Z \wedge b = 50^\circ$ . *Dispersion:*  $r > v$ , strong.  $\alpha = 1.629(1)$   $\beta = 1.682(2)$   $\gamma = 1.691(2)$   $2V(\text{meas.}) = 41(2)^\circ$   $2V(\text{calc.}) = 42^\circ$

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 6.270(2)$   $b = 6.821(3)$   $c = 5.057(2)$   $\alpha = 90.68(2)^\circ$   $\beta = 107.69(2)^\circ$   $\gamma = 104.46(2)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Grand Reef mine, Arizona, USA.  
4.42 (100), 2.595 (70), 2.190 (65), 2.030 (50), 3.221 (40), 2.015 (40), 4.05 (35)

Chemistry:	(1)	(2)
PbO	67.5	68.64
Al <sub>2</sub> O <sub>3</sub>	15.6	15.68
F	16.1	17.52
H <sub>2</sub> O	6.0	5.54
-O = F <sub>2</sub>	6.8	7.38
Total	98.4	100.00

(1) Grand Reef mine, Arizona, USA; by electron microprobe, average of ten analyses, H<sub>2</sub>O by TGA; corresponds to Pb<sub>1.00</sub>Al<sub>1.01</sub>F<sub>2.80</sub>(OH)<sub>2.20</sub>. (2) PbAlF<sub>3</sub>(OH)<sub>2</sub>.

**Occurrence:** In the oxidized zone of an epithermal Cu-Pb-Ag deposit.

**Association:** Calcioaravaipaita, quartz, anglesite, fluorite, galena, linarite, muscovite.

**Distribution:** From the Grand Reef mine, near Klondyke, Aravaipa district, Graham Co., Arizona, USA.

**Name:** Honors Dr. Arthur Roe (1912–1993), American chemist and collector of microscopic minerals, Tucson, Arizona, USA.

**Type Material:** Natural History Museum, Los Angeles, California, USA, 39338.

**References:** (1) Kampf, A.R. and E.E. Foord (1995) Artroeite, PbAlF<sub>3</sub>(OH)<sub>2</sub>, a new mineral from the Grand Reef mine, Graham Co., Arizona: description and crystal structure. *Amer. Mineral.*, 80, 179–183. (2) Kampf, A.R. and E.E. Foord (1996) Calcioaravaipaita, a new mineral, and associated lead fluoride minerals from the Grand Reef mine, Graham County, Arizona. *Mineral. Record*, 27, 293–300.