Fiedlerite $Pb_3Cl_4F(OH)\cdot H_2O$

Crystal Data: Monoclinic or triclinic. *Point Group:* $2/m$ or $\overline{1}$. As crystals, lathlike, tabular on {100}, elongated along [010], rich in additional forms, to 2 mm. *Twinning:* On {100}, common.

Physical Properties: *Cleavage:* {100}, good. Hardness = ∼3.5 D(meas.) = 5.88 D(calc.) = [5.15 (2M) or 5.69 (1A)]

Optical Properties: Transparent. *Color:* Colorless to white; colorless in transmitted light. *Luster:* Adamantine.
Optical Class: Biaxial (–). *Orientation:* $Z = b$; $Y \wedge c = -34°$. *Dispersion:* $r < v$, perceptible. $\alpha = 1.98(1)$ $\beta = 2.04(1)$ $\gamma = 2.10(1)$ 2V(meas.) = Large.

Cell Data: *Space Group:* $P2_1/a$(2M), with $a = 16.681(4)$ $b = 8.043(3)$ $c = 7.281(2)$ $\beta = 102.56(4)°$ Z = 4, or *Space Group:* $P\overline{1}$(1A), with $a = 8.574(3)$ $b = 8.045(4)$ $c = 7.276(2)$ $\alpha = 89.96(4)°$ $\beta = 102.05(4)°$ $\gamma = 103.45(4)°$ Z = 2

X-ray Powder Pattern: Laurium, Greece.
3.89 (100), 2.55 (100), 2.81 (80), 2.01 (60), 3.54 (50), 3.33 (50), 3.22 (50)

Chemistry:

	(1)	(2)
Pb	76.97	76.05
F	2.01	2.32
Cl	17.87	17.35
H	0.35	0.37
O		3.91
Total	97.20	100.00

(1) Laurium, Greece; by electron microprobe, average of five points, H determined by elemental microanalyzer. (2) $Pb_3Cl_4F(OH)\cdot H_2O$.

Polymorphism & Series: 2M and 1A polytypes are known.

Occurrence: Produced by reaction of halide-bearing seawater and metal-bearing slag.

Association: Penfieldite, laurionite, phosgenite, cotunnite (Laurium, Greece). penfieldite, cotunnite (Baratti Beach, Italy).

Distribution: In slag from: Laurium, Greece. Along Baratti Beach, Tuscany, Italy. In South Africa, at the Argent Pb–Zn mines, about 100 km east of Johannesburg, Transvaal.

Name: Honors Karl Gustav Fiedler (1791–1853), Saxon Commissioner of Mines.

Type Material: Museum of Natural History, University of Pisa, Pisa, Italy.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 67–69. (2) Goni, J. and C. Guillemin (1954) Description d'espèces minérales néogènes formées sur des jas d'ancres Romaines immergées. Bull. Soc. fr. Minéral., 77, 474–478. (3) Merlino, S., M. Pasero, and N. Perchiazzi (1994) Fiedlerite: revised chemical formula [$Pb_3Cl_4F(OH)\cdot H_2O$], OD description and crystal structure refinement of the two MDO polytypes. Mineral. Mag., 58, 69–78.