Cuspidine

\( \text{Ca}_4\text{Si}_2\text{O}_7(\text{F}, \text{OH})_2 \)

Crystal Data: Monoclinic. \( \text{Point Group}: 2/m \). Crystals spearhead-shaped, minute. 

Twinning: Simple, lamellar, polysynthetic on \{100\}.

Physical Properties: Cleavage: Very good on \{001\}; distinct on \{110\}. Fracture: Uneven. 
Tenacity: Brittle. Hardness = 5–6 \( \text{D(meas.)} = 2.85–2.96 \) \( \text{D(calc.)} = 2.978 \)


Optical Class: Biaxial (+). Orientation: \( Y = b \); \( Z \wedge c = 6^\circ \). Dispersion: \( r > v \), marked, inclined. Absorption: Moderate. \( \alpha = 1.586–1.592 \) \( \beta = 1.595 \) \( \gamma = 1.598–1.606 \) 
\( 2V(\text{meas.}) = \text{Large} \).

Cell Data: \( \text{Space Group: } P2_1/a \). \( a = 10.906(5) \) \( b = 10.521(6) \) \( c = 7.518(3) \) 
\( \beta = 109.30(3)^\circ \) \( Z = 4 \).

X-ray Powder Pattern: Monte Somma, Italy.
\( 3.062 \) (100), 2.943 (35), 3.259 (30), 2.900 (30), 2.873 (30), 3.034 (25), 2.018 (18)

Chemistry:

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\begin{array}{ccc}
\text{SiO}_2 & 31.79 & 32.36 \\
\text{MnO} & 0.71 & \\
\text{MgO} & 0.00 & \\
\text{CaO} & 59.16 & 61.37 \\
\text{Na}_2\text{O} & \text{trace} & 0.48 \\
\text{K}_2\text{O} & \text{trace} & 0.27 \\
\text{F} & 10.05 & 9.05 \\
\text{Cl} & \text{trace} & \\
\text{H}_2\text{O}^+ & 0.28 & \\
\text{H}_2\text{O}^- & 0.16 & \\
\text{CO}_2 & 0.62 & \\
\text{rem.} & 1.53 & \\
\end{array}
\]

Total 99.36 100.43 100.00

(1) Monte Somma, Italy; remainder is trivalent oxides. (2) Franklin, New Jersey, USA. (3) \( \text{Ca}_4\text{Si}_2\text{O}_7\text{F}_2 \).

Occurrence: In tuff ejecta (Monte Somma, Italy); in contact metamorphosed limestone (Franklin, New Jersey, USA); in melilitite skarn (Dupezh Mountain, Iraq).


Distribution: At Monte Somma and Vesuvius, Campania, and in the Alban Hills, as at Ariccia, Lazio, Italy. From Carlingford, Co. Louth, Ireland. At Broadford and Camas Malag, Isle of Skye, and Camas Mór, Isle of Muck, Scotland. From the Bellerberg volcano, two km north of Mayen, Eifel district, Germany. In the USA, at Franklin, Sussex Co., New Jersey; in the Alder district, Custer Co., Idaho; at Crestmore, Riverside Co., California; on Cascade Mountain, Adirondack Mountains, Essex Co., New York. On Dupezh Mountain, near Hero Town, Qala-Diza region, Iraq. In the Hatrurim Formation, Israel. From Fuka, near Bicchu, and in the Sampo and Mihara mines, Kawakami, Okayama Prefecture, Japan.

Name: From the Greek \textit{cuspis}, for a spear, the characteristic shape of the twinned crystals.