Franzinite  \((\text{Na}, \text{Ca})_7(\text{Si}, \text{Al})_{12}\text{O}_{24}(\text{SO}_4, \text{CO}_3, \text{OH})_3\cdot\text{H}_2\text{O}\)

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Crystal Data:  Hexagonal.  Point Group:  \(\overline{3} \ 2/m, \ 3m, \text{ or } 32\).  As squat prisms, to 1 cm, roughly hexagonal in shape, not of measurable quality.

Physical Properties:  Cleavage:  \{0001\}, distinct.  Hardness = 5  \(D(\text{meas.}) = 2.46\text{--}2.52\)  \(D(\text{calc.}) = 2.52\text{--}2.57\)


Cell Data:  Space Group:  \(\text{P} \overline{3} m\ 1, \ \text{P}3m1, \ \text{P}31m, \text{ or } \text{P}321\).  \(a = 12.884(9)\)  \(c = 26.580(21)\)

Z = 1

X-ray Powder Pattern:  Pitigliano, Italy.  3.72 (100), 3.59 (43), 3.81 (42), 3.56 (39), 2.148 (29), 3.302 (17), 3.054 (16)

Chemistry:

\[
\begin{array}{cccc}
\text{SiO}_2 & 32.44 & 31.85 & \text{K}_2\text{O} & 4.24 & 7.23 \\
\text{Al}_2\text{O}_3 & 25.21 & 25.13 & \text{Cl} & 0.36 & 0.13 \\
\text{Fe}_2\text{O}_3 & 0.04 & 0.10 & \text{H}_2\text{O}^+ & 1.88 & 1.70 \\
\text{MgO} & 0.14 & 0.26 & \text{CO}_2 & 1.54 & 1.98 \\
\text{CaO} & 12.08 & 10.44 & \text{SO}_3 & 10.65 & 10.22 \\
\text{Na}_2\text{O} & 11.50 & 10.99 & -\text{O} = \text{Cl}_2 & 0.08 & 0.03 \\
\end{array}
\]

Total [100.00] [100.00] (1)

(1) Pitigliano, Italy; by a variety of techniques including AA and XRF, recalculated to 100%; corresponding to \((\text{Na}_{4.31}\text{Ca}_{2.50}\text{Mg}_{0.04}\text{Fe}_{0.01})\Sigma=6.86(\text{Si}_{6.26}\text{Al}_{5.74})\Sigma=12.00\text{O}_{24}\)
\([\text{SO}_4]_{1.54}(\text{OH})_{0.70}(\text{CO}_3)_{0.41}\text{Cl}_{0.12}\Sigma=2.77*0.86\text{H}_2\text{O}\).  (2) Ariccia, Italy; methods as for (1), corresponding to \((\text{Na}_{4.15}\text{Ca}_{2.18}\text{Mg}_{0.08}\text{Fe}_{0.01})\Sigma=6.43(\text{Si}_{6.22}\text{Al}_{5.78})\Sigma=12.00\text{O}_{24}[\text{SO}_4]_{1.50}(\text{OH})_{0.64}
\text{ (CO}_3)_{0.53}\text{Cl}_{0.04})\Sigma=2.71*0.79\text{H}_2\text{O}\).

Mineral Group:  Cancrinite group.

Occurrence:  In ejected metasomatized pumice blocks, thought to be the product of a syntectic process between a trachytic magma and carbonate rocks at the volcanic vent.

Association:  Diopside, vesuvianite, afghanite, liottite (Pitigliano, Italy); calcite, leucite (Ariccia, Italy).

Distribution:  In Italy, in the Pitigliano quarry, near Grosseto, Tuscany; and at Sacrofano and Ariccia, near Rome, Lazio.

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