Mirabilite

\[ \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} \]

Crystal Data: Monoclinic. Point Group: \( \text{2} / \text{m} \). Crystals short to long prismatic, with complex form development, also crude, to 10 cm, in interlocking masses; crystalline, granular to compact massive, commonly as efflorescences. Twinning: Rare on \{001\} or \{100\}.

Physical Properties: Cleavage: On \{100\}, perfect; on \{010\} and \{001\}, good to fair. Fracture: Conchoidal. Hardness = 1.5–2.5 D(meas.) = 1.464 D(calc.) = 1.467. Quickly dehydrates to thénardite in dry air; very soluble in \( \text{H}_2\text{O} \), taste cool, then saline and bitter.


Optical Class: Biaxial (−). Orientation: \( X = b \); \( Z \wedge c = 31^\circ \). Dispersion: \( r < v \), strong, crossed. \( \alpha = 1.391–1.394 \) \( \beta = 1.394–1.396 \) \( \gamma = 1.396–1.398 \) \( 2V(\text{meas.}) = 75^\circ56' \)

Cell Data: Space Group: \( \text{P}2_1 / \text{c} \) (synthetic). \( a = 11.512(3) \) \( b = 10.370(3) \) \( c = 12.847(2) \) \( \beta = 107.789(10)^\circ \) \( Z = 4 \)

X-ray Powder Pattern: Synthetic. (ICDD 11-647). 5.49 (100), 3.21 (75), 3.26 (60), 3.11 (60), 4.77 (45), 3.83 (40), 2.516 (35)

Chemistry:

\[
\begin{array}{ccc}
\text{Chemistry} & \text{(1)} & \text{(2)} \\
\text{SO}_3 & 25.16 & 24.85 \\
\text{Na}_2\text{O} & 18.67 & 19.24 \\
\text{H}_2\text{O} & 55.28 & 55.91 \\
\text{Total} & 99.11 & 100.00 \\
\end{array}
\]

(1) Kirkby Thore, Westmoreland, England. (2) \( \text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} \).

Occurrence: Typically in salt pans, playas, and saline lakes, where deposition may be seasonal, and bedded deposits formed therefrom; rarely in caves and lava tubes; in volcanic fumaroles; a product of hydrothermal sericitic alteration; a post-mining precipitate.

Association: Gypsum, thénardite, halite, trona, glauberite, aphthitalite, blödite, epsomite.

Distribution: Only a few prominent localities are represented here. In Austria, at Hallein, Hallstatt, and Ischl. In Italy, on Vesuvius, and at Campi Flegrei, near Naples, Campania; on Vulcaino, Lipari Islands. In the Salar de Pintados, near La Guajira, Atacama Desert, Tarapacá, and at Chuquicamata, Antofagasta, Chile. In the USA, at Soda Lake, San Luis Obispo Co., and in Searles Lake, San Bernardino Co., California; along Great Salt Lake, Davis Co., Utah; at Lake Lucero, west of Valmont, Doña Ana Co., New Mexico; around Downey and Union Pacific Lakes, Albany Co., Wyoming; in Mammoth Cave, southwest central Kentucky.

Name: From the Latin sal mirabile, for miracle salt, expressing Glauber’s surprise on its synthesis.