

Heulandite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals commonly tabular $\parallel \{010\}$, and elongated, widest at the center, hence called “coffin-shaped,” to 12 cm; also granular to massive. *Twinning:* With $\{100\}$ as twin and contact plane.

Physical Properties: *Cleavage:* $\{010\}$, perfect. *Fracture:* Subconchoidal to uneven. *Tenacity:* Brittle. Hardness = 3.5–4 D(meas.) = 2.10–2.20 D(calc.) = 2.17

Optical Properties: Transparent to translucent. *Color:* Colorless, white, gray, yellow, red, pink, orange, brown, black; colorless in thin section. *Streak:* White. *Luster:* Vitreous, pearly on $\{010\}$.

Optical Class: Biaxial (+). *Orientation:* $Z = b$; $X \wedge a = 0^\circ\text{--}34^\circ$; $Y \wedge c = 0^\circ\text{--}32^\circ$.

Dispersion: $r > v$, distinct, crossed. $\alpha = 1.491\text{--}1.505$ $\beta = 1.493\text{--}1.503$ $\gamma = 1.500\text{--}1.512$
 $2V(\text{meas.}) = 0^\circ\text{--}55^\circ$ $2V(\text{calc.}) = 34^\circ$

Cell Data: *Space Group:* $C2/m$. $a = 17.77(2)$ $b = 17.95(2)$ $c = 7.435(7)$
 $\beta = 116.46(5)^\circ$ $Z = 4$

X-ray Powder Pattern: Giebelsbach, Switzerland.

3.917 (100), 2.959 (90), 8.84 (80), 7.80 (70), 5.096 (70), 3.420 (70), 2.805 (70)

Chemistry:	(1)	(2)	(1)	(2)	
SiO ₂	60.06	57.17	BaO	0.75	0.31
Al ₂ O ₃	13.65	17.03	Na ₂ O	1.07	1.39
Fe ₂ O ₃	1.16	0.04	K ₂ O	0.66	0.73
MgO	0.38	0.02	H ₂ O ⁺	12.43	
CaO	4.44	7.13	H ₂ O ⁻	3.11	
SrO	1.35	0.19	H ₂ O		16.71
			Total	99.06	100.72

(1) Col Aut, Buffaure, Trentino-Alto Adige, Italy; corresponds to $(\text{Ca}_{0.56}\text{Na}_{0.24}\text{K}_{0.10}\text{Sr}_{0.09}\text{Mg}_{0.07}\text{Ba}_{0.03})_{\Sigma=1.09}\text{Al}_{1.89}\text{Fe}_{0.10}\text{Si}_{7.05}\text{O}_{18} \cdot 6.08\text{H}_2\text{O}$. (2) Faeroe Islands; corresponds to $(\text{Ca}_{0.89}\text{Na}_{0.32}\text{K}_{0.11}\text{Ba}_{0.02}\text{Sr}_{0.01})_{\Sigma=1.35}\text{Al}_{2.34}\text{Si}_{6.68}\text{O}_{18} \cdot 6.50\text{H}_2\text{O}$.

Mineral Group: Zeolite group.

Occurrence: In cavities in basalts; in highly weathered andesites and diabases; as a devitrification product of volcanic glasses and tuffs.

Association: Zeolites, datolite, apophyllite, calcite.

Distribution: Many localities, even for fine specimens. Exceptional crystals from the Teigarhorn, Berufjord, Iceland. At Haldarsvik, on Streymoy, Faeroe Islands. Around Glasgow, Dumbartonshire, Scotland. At Giebelsbach, near Fiesch, Valais, Switzerland. In the USA, at Paterson, Passaic Co., and Bergen Hill, Hudson Co., New Jersey; at Goble, Columbia Co., and elsewhere in Oregon; at Skookumchuck Dam, near Bucoda, Thurston Co., Washington. From Cape Blomidon, Nova Scotia, Canada. From near Bento Gonçalves, Rio Grande do Sul, Brazil. Large crystals from the Nasik, Poona, and Bombay districts, Maharashtra, India. At Tambar Springs, near Gunnedah, New South Wales, Australia.

Name: For the English mineral collector and dealer John Henry Heuland (1778–1856).

References: (1) Dana, E.S. (1892) Dana’s system of mineralogy, (6th edition), 573–576. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 4, framework silicates, 377–384. (3) Alietti, A. (1972) Polymorphism and crystal chemistry of heulandites and clinoptilolites. Amer. Mineral., 57, 1448–1462. (4) Alberti, A. (1972) On the crystal structure of the zeolite heulandite. Tschermarks Mineral. Petrog. Mitt., 18, 129–146. (5) Hambley, T.W. and J.C. Taylor (1984) Neutron diffraction studies on natural heulandite and partially dehydrated heulandite. J. Solid State Chem., 54, 1–9. (6) Merkle, A.B. and M. Slaughter (1968) Determination and refinement of the structure of heulandite (1968) Amer. Mineral., 53, 1120–1138.

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