

Ramsbeckite**(Cu, Zn)₁₅(SO₄)₄(OH)₂₂•6H₂O**

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Crystal Data: Monoclinic, pseudohexagonal. *Point Group:* 2/*m*. Crystals are tabular with large {001}, also {210}, {110}, {100}, giving a slightly rounded rhombic outline, to 3 mm. *Twinning:* Observed, repeated, forming cylindrical aggregates.

Physical Properties: *Cleavage:* On {001}, perfect. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 3.5 D(meas.) = 3.39–3.41 D(calc.) = 3.37

Optical Properties: Transparent to translucent. *Color:* Green, blue-green. *Streak:* Pale green. *Luster:* Vitreous.

Optical Class: Biaxial (-). *Pleochroism:* Weak; X = pale blue-green, emerald-green; Y = Z = blue-green, yellow-green. *Orientation:* Y = b; X ∧ c = 5°; Z ∧ a = 5°. *Absorption:* X > Y = Z. α = 1.624–1.669 β = 1.674–1.703 γ = 1.678–1.707 2V(meas.) = 36°–38° 2V(calc.) = 38.0°

Cell Data: *Space Group:* P2₁/a. a = 16.088–16.110 b = 15.576–15.602 c = 7.102–7.112 β = 90.0°–90.27° Z = 2

X-ray Powder Pattern: Bastenberg mine, Ramsbeck, Germany. 7.090 (100), 3.549 (25), 1.776 (20), 3.254 (13), 4.400 (12), 3.232 (12), 3.244 (11)

Chemistry:	(1)	(2)	(3)
SO ₃	17.4	17.6	17.51
CuO	44.5	43.8	43.49
ZnO	15.8	18.1	22.25
H ₂ O	19.3	[20.5]	16.75
Total	97.0	[100.0]	100.00

(1) Bastenberg mine, Ramsbeck, Germany; SO₄ by photometry, CuO, ZnO by AA, H₂O by gas chromatography, (OH)¹⁻ computed for charge balance; corresponds to (Cu_{10.30}Zn_{3.58})_{Σ=13.88}(SO₄)_{4.00}(OH)_{19.76}•9.84H₂O. (2) Ecton mine, Pennsylvania, USA; by electron microprobe, H₂O by difference, (OH)¹⁻ computed for charge balance; corresponds to (Cu_{10.03}Zn_{4.05})_{Σ=14.08}(SO₄)_{4.00}(OH)_{20.17}•10.64H₂O. (3) (Cu, Zn)₁₅(SO₄)₄(OH)₂₂•6H₂O with Cu:Zn = 2:1.

Occurrence: Rarely formed by supergene oxidation in dump materials and slag.

Association: Chalcopyrite, linarite, brochantite, serpierite, schulenbergite, smithsonite, hydrozincite, connellite, chalcophyllite (Germany); linarite, anglesite, pyromorphite, posnjakite, serpierite (Ecton mine, Pennsylvania, USA).

Distribution: In Germany, from the Bastenberg mine, Ramsbeck, North Rhine-Westphalia; at the Rammelsberg mine, near Goslar, the Glücksrad mine, near Oberschulenberg, the Wildemann mine, and elsewhere in the Harz Mountains; from the Friedrichsseggen mine, near Bad Ems, Rhineland-Palatinate; and in the Marie mine, near Wilnsdorf, Siegerland. From the Waterbank mine, Wetton, Staffordshire, England. In Wales, at the Dylife mine, Machynlleth, Powys; in the Brynarian mine, Talybont, the Penrhiw mine, Ystumtuen, and the Frongoch mine, Dyfed. In the Veneziana mine, near Torrebelvicino, Veneto, Italy. From the Ecton mine, Audubon, Montgomery Co., Pennsylvania, USA.

Name: For Ramsbeck, Germany, near the location from which the species was first noted.

Type Material: University of Göttingen, Göttingen, Germany.

References: (1) Hodenberg, R.v., W. Krause, G. Schnorrer-Köhler, and H. Täuber (1985) Ramsbeckite, (Cu, Zn)₇(SO₄)₂(OH)₁₀•5H₂O, a new mineral. Neues Jahrb. Mineral., Monatsh., 550–556. (2) (1987) Amer. Mineral., 72, 225 (abs. ref. 1). (3) Peacor, D.R., P.J. Dunn, and B.D. Sturman (1987) Ramsbeckite: an American occurrence at the Ecton mine, Pennsylvania. Mineral. Record, 18, 131–132. (4) Effenberger, H. (1988) Ramsbeckite, (Cu, Zn)₁₅(OH)₂₂(SO₄)₄•6H₂O: revision of the chemical formula based on a structure determination. Neues Jahrb. Mineral., Monatsh., 38–48. (5) Orlandi, P. and N. Perchiazzi (1989) Ramsbeckite, (Cu, Zn)₁₅(OH)₂₂(SO₄)₄•6H₂O, a first occurrence for Italy from “La Veneziana” mine, Valle dei Mercanti, Vicenza. Eur. J. Mineral., 1, 147–149.

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