### Clinochlore

\[ (\text{Mg}, \text{Fe}^{2+})_5\text{Al} (\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8 \]

**Crystal Data:** Monoclinic. Point Group: 2/m. In thin to thick pseudohexagonal crystals, with tapering pyramidal faces, to 10 cm. Commonly foliated, fibrous, granular, earthy, massive. Twinning: Twin plane \{001\}; twin axis [310], composition plane \{001\}.

**Physical Properties:** Cleavage: \{001\}, perfect. Tenacity: Laminae flexible, inelastic. Hardness: 2–2.5 D(meas.) = 2.60–3.02 D(calc.) = 2.628

**Optical Properties:** Transparent to translucent. Color: Grass-green, olive-green, yellowish, white; pink, rose-red; colorless to pale green or yellow in thin section. Streak: Greenish white to white. Luster: Pearly, greasy, dull.

**Optical Class:** Biaxial (+) or (–). Pleochroism: Distinct; X = light yellow-green to light blue-green; Y = Z = light greenish yellow to light blue-green. Orientation: Y = b; Z ∧ c = 2°–9°. Dispersion: r < v. Absorption: Y ≈ Z > X or Z ≈ Y > Z. \( \alpha = 1.571–1.588 \) \( \beta = 1.571–1.588 \) \( \gamma = 1.576–1.597 \) 2V(meas.) = 0°–50°

**Cell Data:** Space Group: C2/m. \( a = 5.350(3) \) \( b = 9.267(5) \) \( c = 14.27(1) \) \( \beta = 96.35(5)^\circ \) \( Z = 2 \)

**X-ray Powder Pattern:** Synthetic (IIb structure); berthierine plus clinochlore easily mistaken for chamosite.

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<tr>
<th>3.57 (100)</th>
<th>2.540 (100)</th>
<th>2.008 (100)</th>
<th>1.539 (100)</th>
<th>1.41 (80)</th>
<th>7.14 (80)</th>
<th>4.76 (80)</th>
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**Chemistry:**

| \( \text{SiO}_2 \) | 33.83 | 32.12 | MgO | 34.94 | 35.36 |
| \( \text{Al}_2\text{O}_3 \) | 12.95 | 9.50 | CaO | 1.24 |
| \( \text{Fe}_2\text{O}_3 \) | 2.25 | | H₂O⁺ | 13.11 | 10.25 |
| \( \text{Cr}_2\text{O}_3 \) | 7.88 | | H₂O⁻ | 2.04 |
| FeO | 3.02 | 1.98 | | |
| **Total** | 100.10 | 100.37 |

(1) Zillertal, Austria; corresponds to \((\text{Mg}_{4.94}\text{Fe}^{2+}_{0.04})_{\Sigma=5.08} (\text{Al}_{0.65}\text{Fe}^{3+}_{0.35})_{\Sigma=0.81}\) \((\text{Si}_{5.21}\text{Al}_{0.79})_{\Sigma=4.00}\text{O}_{10}(\text{OH})_8\).

(2) Deer Park, Wyoming, USA; corresponds to \((\text{Mg}_{5.05}\text{Fe}^{2+}_{0.66}\text{Ca}_{0.13})_{\Sigma=5.34} (\text{Cr}_{0.60}\text{Al}_{0.15}\text{Fe}^{3+}_{0.15})_{\Sigma=0.90} (\text{Si}_{3.08}\text{Al}_{0.92})_{\Sigma=4.00}\text{O}_{10}(\text{OH})_8\).

**Polymorphism & Series:** Forms a series with chamosite; stacking disorder is common.

**Mineral Group:** Chlorite group.

**Occurrence:** A hydrothermal alteration product of amphiboles, pyroxenes, biotite. In chlorite schists, serpentinites, marbles, calc-silicate rocks, amphibolites, less commonly in ultramafic rocks. In ore veins; a detrital component of sediments.

**Association:** Serpentine, calcite, dolomite, actinolite, biotite, olivine, plagioclase, talc, chromite, uvarovite.

**Distribution:** Some localities for well-crystallized material are: in the USA, in the Emery mine, Chester, Hampden Co., Massachusetts; at Texas, Lancaster Co., and West Chester, Chester Co., Pennsylvania; in the Tilly Foster mine, Brewster, Putnam Co., New York. In the Zillertal, Tirol, Austria. From the Pfitschtal, Trentino-Alto Adige; Val Malenco, Lombardy; and at Ala, Piedmont, Italy. At Rimpfischwänge, near Zermatt, Valais, Switzerland. From Ojén, Málaga Province, Spain. On Unst, Shetland Islands, Scotland. In the Kop Krom [chrome mine], Kop Mountains, near Aşkale, Turkey. In Russia, in the Ural Mountains, at Akhmatovsk, Berblouchka, and Hardadinsk; and at Miass, Ilmen Mountains, Southern Ural Mountains.

**Name:** For its inclined optic axes and the Greek chloros, for green, its common color.

**References:**