## Magnesio-riebeckite $Na_2[(Mg,Fe^{2+})_3Fe^{3+}_2]Si_8O_{22}(OH)_2$

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**Crystal Data:** Monoclinic. *Point Group:* $2/m$. [As prismatic crystals. Also columnar, fibrous, or granular aggregates.] *Twinning:* [Simple or multiple twinning ∥ {100}.]

**Physical Properties:** *Cleavage:* [Perfect on {110}, intersecting at ~58° and ~122°; partings on {010}, {001}.] *Fracture:* [Conchoidal to uneven.] *Tenacity:* [Brittle.] Hardness = [6] D(meas.) = 3.12–3.29 D(calc.) = [3.15]

**Optical Properties:** Semitransparent. *Color:* Blue, black; light blue in thin section. *Luster:* [Vitreous.]
*Optical Class:* Biaxial (+) or (–). *Pleochroism:* Strong; $X$ = dark blue; $Y$ = indigo; $Z$ = yellow-green. *Orientation:* $Y = b$; $X \wedge c = 15°–32°$. $\alpha$ = 1.657–1.673 $\beta$ = 1.660–1.677 $\gamma$ = 1.657–1.675 2V(meas.) = 0°–80°

**Cell Data:** *Space Group:* $C2/m$. $a = 9.745$ $b = 17.912$ $c = 5.278$ $\beta = 103.49°$ Z = 2

**X-ray Powder Pattern:** Puolanka, Finland. (ICDD 29-1236).
3.09 (100), 8.35 (99), 4.23 (20), 3.25 (18), 4.49 (16), 2.692 (12), 3.40 (9)

**Chemistry:**

| | (1) | (2) | | (1) | (2) |
|---|---|---|---|---|---|
| $SiO_2$ | 54.84 | 56.1 | MgO | 8.91 | 14.5 |
| $TiO_2$ | 0.27 | | CaO | 2.74 | 1.11 |
| $Al_2O_3$ | 1.80 | 0.66 | $Na_2O$ | 5.58 | 5.05 |
| $Fe_2O_3$ | 11.69 | 15.6 | $K_2O$ | 0.16 | 0.71 |
| FeO | 12.11 | 4.06 | $H_2O^+$ | | [2.21] |
| MnO | 0.43 | | $H_2O^-$ | | 0.03 |
| | | | Total | 98.53 | [100.03] |

(1) Kodiak Islands, Alaska, USA; by electron microprobe, $Fe^{2+}$:$Fe^{3+}$ calculated; corresponding to $(Na_{1.56}Ca_{0.43}K_{0.03})_{\Sigma=2.02}(Mg_{1.93}Fe^{2+}_{1.47}Fe^{3+}_{1.27}Al_{0.26}Mn_{0.05}Ti_{0.03})_{\Sigma=5.01}(Si_{7.95}Al_{0.05})_{\Sigma=8.00}O_{22}(OH)_2$. (2) Cochabamba Province, Bolivia; $H_2O$ calculated from stoichiometry, corresponding to $(Na_{1.38}Ca_{0.17}K_{0.13})_{\Sigma=1.68}(Mg_{3.06}Fe^{3+}_{1.66}Fe^{2+}_{0.48}Al_{0.05})_{\Sigma=5.25}(Si_{7.94}Al_{0.06})_{\Sigma=8.00}O_{22}(OH)_2$.

**Polymorphism & Series:** Forms a series with riebeckite.

**Mineral Group:** Amphibole (alkali) group: $Fe^{2+}/(Fe^{2+} + Mg) < 0.5$; $Fe^{3+}/(Fe^{3+} + Al^{vi}) \geq 0.7$; $(Na + K)_A < 0.5$; $Na_B \geq 1.34$.

**Occurrence:** In granulites, ironstones, ferruginous metacherts, greenschist facies schists, and carbonatites.

**Association:** Stilpnomelane, epidote, quartz, muscovite, winchite.

**Distribution:** Many localities; may be in large deposits of asbestiform material. In the Ternovsk mine, Krivoy-Rog basin, Ukraine. From the Norra Kärr complex, near Gränna, Sweden. In Bolivia, around Chapare, Cochabamba Province. In South Africa, over a large area from Koegas, Cape Province, to Botswana, and to the east of Pietersburg, Transvaal. At Lusaka, Zambia. Through the Hamersley Ranges, Western Australia. At Bizan and Suberidani, Tokushima Prefecture, Japan. In the USA, at Franklin, Sussex Co., New Jersey.

**Name:** For its high *magnesium* content and similarity to *riebeckite*.

**Type Material:** n.d.

**References:** (1) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 2, chain silicates, 333–351 [riebeckite, in part]. (2) Whittaker, E.J.W. (1949) The structure of Bolivian crocidolite. Acta Cryst., 2, 312–317. (3) Borg, I.Y. (1967) Optical properties and cell parameters in the glaucophane-riebeckite series. Contr. Mineral. Petrol., 15, 67–92. (4) Roeske, S.M. (1986) Field relations and metamorphism of the Raspberry Schist, Kodiak Islands, Alaska. In: B.W. Evans and E.H. Brown, Eds., Blueschists and eclogites, Geol. Soc. Amer. Memoir 164, 169–184. (5) Phillips, W.R. and D.T. Griffen (1981) Optical mineralogy, 237–241.

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