Byrudite $(Be,\square)(V,Ti)_3O_6$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. Crystals acicular to bladed, striated and with six-sided cross sections, to 1 mm. *Twinning*: Polysynthetic on {210}.

Physical Properties: *Cleavage*: None. *Fracture*: Uneven. *Tenacity*: Brittle. Hardness = ~ 7 VHN = 1493 (100 g load). D(meas.) = n.d. D(calc.) = 4.29

Optical Properties: Opaque. *Color*: Black; gray in reflected light. *Streak*: Black. *Luster*: Metallic. *Optical Class*: n.d.
R_1-R_2: (470) 16.6-17.5, (546) 16.7-17.9, (589) 16.8-18.3, (650) 16.8-18.6

Cell Data: *Space Group*: *Pnma*. *a* = 9.982(1) *b* = 8.502(1) *c* = 4.5480(6) Z = 4

X-ray Powder Pattern: Byrud farm, Akershus County, South Norway.
2.965 (100), 3.721 (72), 1.671 (66), 2.561 (50), 2.464 (41), 1.681 (34), 2.167 (24)

Chemistry:	(1)
BeO	[8.04]
Al_2O_3	1.44
V_2O_3	37.86
Cr_2O_3	8.79
Fe_2O_3	2.66
TiO_2	38.36
Total	97.15

(1) Byrud farm, Akershus County, South Norway; average of 6 electron microprobe analyses, BeO calculated from structure analysis and verified by secondary ion mass spectrometry; corresponding to $(Be_{0.84}\square_{0.16})(V^{3+}_{1.32}Ti_{1.25}Cr_{0.29}Fe_{0.09}Al_{0.07})_{\Sigma=3.02}O_6$.

Occurrence: A primary magmatic phase in emerald-bearing, syenitic pegmatite.

Association: Quartz, microcline, beryl (emerald), muscovite, fluorite, fluorapatite.

Distribution: At Byrud farm, near Minnesund, Eidsvoll municipality, Akershus County, South Norway.

Name: For the locality where the first specimens were collected, *Byrud* farm, Norway.

Type Material: Natural History Museum, University of Oslo, Norway (43570) and the Earth Sciences Department, Natural History Museum, London, England (BM 2013,128).

References: (1) Raade, G., T. Balić-Žunić, and C.J. Stanley (2015) Byrudite, $(Be,\square)(V^{3+},Ti)_3O_6$, a new mineral from the Byrud emerald mine, South Norway. Mineral. Mag., 79(2), 261-268.
(2) Raade, G. and T. Balić-Žunić (2006) The crystal structure of $(Be,\square)(V,Ti)_3O_6$, a mineral related to kyzylkumite. Can. Mineral., 44(5), 1147-1158. (3) (2016) Amer. Mineral., 101, 1241 (abs. refs. 1 & 2).