

## Boralsilite ( $\text{Al}_{16}\text{B}_6\text{Si}_2\text{O}_{37}$ ): A new mineral related to sillimanite from pegmatites in granulite-facies rocks

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### ABSTRACT

Boralsilite, the first natural anhydrous Al-B-silicate, is a high-temperature phase in pegmatites cutting granulite-facies metapelitic rocks at Larsemann Hills, Prydz Bay, east Antarctica (type locality) and Almgjotheii in the contact aureole of the Rogaland Intrusive Complex, southwestern Norway. Stable assemblages include: (1) quartz-potassium feldspar-boralsilite-schorl/dravite (Larsemann Hills); (2) potassium feldspar-plagioclase( $\text{An}_{22}$ )-boralsilite-werdingite-dumortierite-grandidierite (Almgjotheii); (3) quartz-potassium feldspar-boralsilite-dumortierite-andalusite  $\pm$  sillimanite (Almgjotheii). Boralsilite is estimated to have formed between 600 and 750 °C and 3–5 kbar at conditions where  $P_{\text{H}_2\text{O}} < P_{\text{tot}}$ . The name is from the composition, *boron*, *aluminum*, and *silicon*. Representative electron and ion microprobe (SIMS) analyses of Larsemann Hills are:  $\text{SiO}_2$  10.05 [12.67];  $\text{Al}_2\text{O}_3$  71.23 [69.15];  $\text{FeO}$  0.48 [1.10];  $\text{MgO}$  below detection [0.23];  $\text{BeO}$  0.004 [0.094];  $\text{B}_2\text{O}_3$  19.63 [18.11] wt%, totals 101.39 [101.35] wt% where the numbers in brackets were determined from Almgjotheii material. However, the SIMS  $\text{B}_2\text{O}_3$  values appear to be systematically too high; boron contents calculated assuming  $\text{B} + \text{Si} = 8$  and  $\text{O} = 37$  atoms per formula unit (apfu) yield  $\text{B}_2\text{O}_3$  18.53 wt% corresponding to  $\text{Fe}_{0.08}\text{Al}_{15.98}\text{B}_{6.09}\text{Si}_{1.91}\text{O}_{37}$  ideally  $\text{Al}_{16}\text{B}_6\text{Si}_2\text{O}_{37}$  for Larsemann Hills. The analogous composition of  $\text{Mg}_{0.07}\text{Fe}_{0.18}\text{Al}_{15.66}\text{Be}_{0.04}\text{B}_{5.565}\text{Si}_{2.435}\text{O}_{37}$  for Almgjotheii appears to result from solid solution of boralsilite with sillimanite (or  $\text{Al}_8\text{B}_2\text{Si}_2\text{O}_{19}$ ) and subordinate werdingite. Boralsilite forms prisms up to 2 mm long  $\parallel b$  and 0.25 mm across and is commonly euhedral in cross section. It is colorless and prismatic cleavage is fair. Optically, it is biaxial (+); at  $\lambda = 589$  nm, the Larsemann Hills material has  $\alpha = 1.629(1)$ ,  $\beta = 1.640(1)$ ,  $\gamma = 1.654(1)$ ,  $2V_{\text{meas}} = 81.8(6)$ ,  $r > v$  extremely weak, and  $\gamma \parallel b$ . It is monoclinic, space group  $C2/m$  with lattice parameters for Larsemann Hills of  $a = 14.767(1)$ ,  $b = 5.574(1)$ ,  $c = 15.079(1)$  Å,  $\beta = 91.96(1)^\circ$ ,  $V = 1240.4(2)$  Å<sup>3</sup>,  $Z = 2$ , and  $D_{\text{calc}} = 3.07$  g/cm<sup>3</sup>.