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Aluminocerite-Ce: A new species from Baveno, Italy: Description and crystal-structure determination

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Abstract

Aluminocerite-(Ce), ideally $(Ce,Ca)_9Al(SiO_4)_3[SiO_3(OH)]_4(OH)_3$, is isostructural with cerite-(Ce) and cerite-(La). The holotype was found at the Ratti quarry, near Baveno, Italy, in millimeter-sized secondary cavities hosted in aplite-pegmatite veins and pods within pink granite. Aluminocerite-(Ce) forms aggregates of pseudo-octahedral to rhombohedral crystals flattened on the *c* axis. The cotype of aluminocerite-(Ce) was discovered at the Locatelly quarry, also near Baveno, where it occurs in centimeter-sized miarolitic cavities in pink granite. The mineral is pale pink to pink-reddish, with a white streak, and is translucent with a vitreous luster. Aluminocerite-(Ce) is non-fluorescent. The hardness based on the Mohs scale is 5, and the tenacity is brittle. Neither cleavage, fracture, or twinning were observed. Calculated density is 4.675 g/cm^3. It is uniaxial, optically positive, with n_o = 1.810–1.816 and n_e = 1.812–1.822 (λ = 589 nm) and non-pleochroic. The average of 15 electron microprobe analyses for the holotype gave (wt%): Ce_2O_3 23.37; Nd_2O_3 15.59; La_2O_3 7.43; Sm_2O_3 4.38; Pr_2O_3 3.54; Gd_2O_3 3.12; Y_2O_3 1.68; Dy_2O_3 0.46; Yb_2O_3 0.07; CaO 8.31; Fe_2O_3 0.47; Al_2O_3 2.47; SiO_2 24.01; and H_2O 3.63 (calculated from crystal-chemical constraints), total 98.53 wt%, corresponding to the empirical formula $(Ca_{2.60}Ce_{2.49}Nd_{1.62}La_{0.80}Sm_{0.44}Pr_{0.38}Gd_{0.30}Y_{0.26}Dy_{0.04}Yb_{0.01})_{\Sigma 8.94}(Al^{3+}_{0.85}Fe^{3+}_{0.10})_{\Sigma 0.95}(SiO_4)_3[SiO_3(OH)]_4(OH)_{3.06}$, calculated on the basis of Si = 7. Aluminocerite-(Ce) is trigonal, space group *R*3*c*, with *a* =10.645(1), *c* = 38.019(5) Å, *V* = 3731 Å^3. The strongest eight lines in the X-ray powder diffraction pattern are [*d* in Å (*I*)(*hkl*)]: 3.405(27)(122), 3.250(26)(124), 2.914(100)(02,10), 2.647(58)(220), 2.198(40)(03,12), 1.923(34) (238), 1.826(24)(051), and 1.732(46)(03,18). The crystal structure has been refined to *R*1 = 0.056 for 745 observed reflections. The name is an allusion to the fact that it is the Al-dominant analog of cerite-(Ce).

Keywords: Aluminocerite-(Ce), single-crystal XRD, EMP analyses, new mineral, Raman spectroscopy