American Mineralogist, Volume 90, pages 1163–1166, 2005

Niksergievite, $[Ba_{1.33}Ca_{0.67}Al(CO_3)(OH)_4][Al_2(AlSi_3O_{10})(OH)_2]\cdot nH_2O$, a new phyllosilicate related to the surite-ferrisurite series

Sergey P. Saburov,[1] Sergey N. Britvin,[2,*] Galiya K. Bekenova,[1] Marina N. Sergieva,[1] Petr E. Kotelnikov,[1] Nikita V. Chukanov,[3] and Mariya A. Yagovkina[4]

[1]Satpaev Institute of Geological Sciences, Kabanbai batyr, 69a, Almaty, 480100, Kazakhstan
[2]Department of Mineral Deposits, St. Petersburg State University, Universitetskaya Naberezhnaya 7/9, RU-199034 St. Petersburg, Russia
[3]Institute of Chemical Physics, Russian Academy of Sciences, Chernogolovka, RU-142432 Moscow oblast, Russia
[4]Ioffe Physico-Technical Institute, Russian Academy of Sciences, Polytekhnicheskaya Ulitsa 26, RU-194021 St. Petersburg, Russia

Abstract

Niksergievite, $[Ba_{1.33}Ca_{0.67}Al(CO_3)(OH)_4][Al_2(AlSi_3O_{10})(OH)_2]\cdot nH_2O$, is a new phyllosilicate closely related to the surite-ferrisurite series. It was found at the –400 m level of the Tekeli Pb-Zn mine, southeast Kazakhstan (44° N, 78° E). The mineral occurs as curved plates 3–5 mm in size forming rosette-like aggregates up to 5 cm across. Associated minerals include calcite, quartz, dolomite, celsian, sphalerite, pyrite, barite, and montmorillonite. Niksergievite is white with a light greenish tint and pearly luster on cleavage planes. The streak is white and the mineral is non-fluorescent. The Mohs hardness is 1–1$^1/_2$. The cleavage is perfect (mica-like) on {001}. D_m = 3.16 g/cm^3 and D_x = 3.21 g/cm^3. The IR spectrum shows the following peaks (* shoulder): 3665*, 3640, 3405, 1630, 1454, 1105*, 1080*, 1035, 1020*, 980*, 960*, 920*, 876, 835*, 750*, 704, 625*, 560*, 535, 474, and 417 cm^{-1}. Optically, the mineral is colorless, non-pleochroic, biaxial (–), $2V$ = 0–10°, α = 1.580(2), β = 1.625(2), γ = 1.625(2), and $X \sim c$. The chemical composition (electron microprobe, CO_2 and H_2O by TGA) is K_2O 0.1, CaO 5.1, BaO 27.1, MgO 0.4, FeO 0.2, Al_2O_3 24.8, SiO_2 28.7, CO_2 6.1, and H_2O 8.3, with a total of 100.8 wt%. The empirical formula based on (Si + Al + Mg + Fe) = 7 is $(Ba_{1.27}Ca_{0.65}K_{0.02})_{1.92}(Al_{3.49}Si_{3.42}Mg_{0.07}Fe^{2+}_{0.02})_{7.00}O_{10.00}(CO_3)_{0.99}(OH)_{6.20}\cdot 0.20H_2O$. The simplified formula is $(Ba,Ca)_2(Al,Si)_7O_{10}(CO_3)(OH)_6\cdot nH_2O$ and the proposed structural formula is $[Ba_{1.33}Ca_{0.67}Al(CO_3)(OH)_4][Al_2(AlSi_3O_{10})(OH)_2]\cdot nH_2O$. The mineral is monoclinic, $C2/c$, $C2$, or Cm, a 5.176(3), b 8.989(3), c 16.166(5) Å, β 96.44(6)°, V 747.4(9) Å^3, Z = 2. The strongest reflections in the X-ray powder diffraction pattern are as follows [d in Å, (I) (hkl)]: 16.1(40)(001), 4.49(90)(020), 3.68(60)(014,$\bar{1}$13), 2.585(100)(130,$\bar{2}$01, $\bar{1}$31), 2.230(90)($\bar{1}$34,220), 2.069(80)(043), 1.692(60)($\bar{3}$11,$\bar{1}$51,240). It is named in honor of Prof. Nikolai Grigorievich Sergiev (1901–1960) for his contributions to the geology of Kazakhstan.