European Mineralogical Conference
Vol. 1, EMC2012-55, 2012
European Mineralogical Conference 2012

B- and As-bearing galuskinite and B-analog of galuskinite from Upper Chegem caldera, Northern Caucasus, Russia

B. Lazic (1), T. Armbruster (1), I.O. Galuskina (2), G. Zieliński (3), P. Dzierżanowski (4), and E.V. Galuskin (2)

(1) Mineralogical Crystallography, Institute of Geological Sciences, University of Bern, Freiestrasse 3, CH-3012 Bern, Switzerland, (2) University Of Silesia, Faculty of Earth Sciences, Department of Geochemistry, Mineralogy and Petrography, Sosnowiec, Poland (irina.galuskina@us.edu.pl), (3) Polish Geological Institute-National Research Institute, Rakowiecka Street 4, 00-975 Warsaw, Poland, (4) Institute of Geochemistry, Mineralogy and Petrology, University of Warsaw, al. Żwirki i Wigury 93, 02-089 Warszawa, Poland

Recently, a new mineral galuskinite, $Ca_7(SiO_4)_3CO_3$ ($P2_1/c$, a = 18.79, b = 6.72, c = 10.47 Å, β = 90.79°, Z = 4), was described from thin veins cutting larnite skarns of the Birkhin Massif (Baikal, Russia). The galuskinite structure can be viewed as built by spurrite $Ca_5(SiO_4)_2CO_3$ and larnite β-Ca_2SiO_4 modules (Lazic et al. 2011). A skarn zone of galuskinite-larnite composition was also noted in an altered carbonate-silicate xenolith within ignimbrite of the Upper Chegem caldera (Northern Caucasus, Russia). Within this rock As-bearing hydroxylellestadite, chegemite, reinhardbraunsite, rondorfite, killalaite and srebrodolskite show spotty distribution. Galuskinite from Caucasus is characterized by significant content of B (1-4 wt.% of B_2O_3) and occasionally As (up to 4 wt.% As_2O_5). Boron was measured using CAMECA SX100 electron probe micro analyzer equipped with PC2 crystal at 5 kV and 200 nA. As-free galuskinite is characterized by low boron content: $(Ca_{6.96}Na_{0.04})_{\Sigma7}[(SiO)_{2.76}(HSiO_4)_{0.17}(SO_4)_{0.04}(PO_4)_{0.03}]_{\Sigma3}[(CO_3)_{0.76}(BO_3)_{0.24}]_{\Sigma1}$ (CO_2 $\approx$ 5.8 wt.%, B_2O_3 $\approx$ 1.3 wt.%). The crystal structure of As- and B-bearing galuskinite with the crystal chemical formula $(Ca_{6.94}Na_{0.06})_{\Sigma7}[(SiO)_{2.53}(HSiO_4)_{0.25}(AsO_4)_{0.15}(SO_4)_{0.05}(PO_4)_{0.02}]_{\Sigma3}[(CO_3)_{0.54}(BO_3)_{0.46}]_{\Sigma1}$ (CO_2 $\approx$ 3.8 wt.%, B_2O_3 $\approx$ 2.6 wt.%) was refined from X-ray single crystal data in space group $P2_1/c$(a = 18.82, b = 6.76, c = 10.47 Å, β = 90.56° and Z = 4). High boron content in this galuskinite increases the mean distance (C, B)-O = 1.34 Å whereas in B-free galuskinite from Baikal C-O = 1.29 Å. Galuskinite crystals (100-200 μm in size) from Caucasus are inhomogeneous in their marginal zones with B > C: $(Ca_{6.92}Na_{0.08})_{\Sigma7}[(SiO)_{2.40}(HSiO_4)_{0.41}(AsO_4)_{0.11}(SO_4)_{0.06}(PO_4)_{0.02}]_{\Sigma3}[(BO_3)_{0.58}(CO_3)_{0.42}]_{\Sigma1}$($CO_2$ $\approx$ 3 wt.%, B_2O_3 $\approx$ 3.2 wt.%). Incorporation of boron in galuskinite follows the schemes: $(SiO_4)^{4-}(CO_3)^{2-}$ $\rightarrow$ $(HSiO_4)^{3-}(BO_3)^{3-}$ and $\rightarrow$ $(AsO_4)^{3-}(BO_3)^{3-}$. Thus existence of the possible end-members: $Ca_7(SiO_4)_2(HSiO_4)(BO_3)$ and $Ca_7(SiO_4)_2(AsO_4)(BO_3)$ is expected. Maximum contents of these end-members in B-bearing minerals of the galuskinite series reach 65% and 25%, respectively. In the Raman spectrum of the boron analog of galuskinite the intensity of the band at 1077 cm^{-1} (C-O stretching vibration) decreases strongly and new bands at about 3600 cm^{-1} (O-H stretching vibration) and 650 cm^{-1}(B-O bending vibration) become obvious. Our investigations indicate the existence of a potential new mineral with the end-member crystal chemical formula $Ca_7(SiO_4)_2(HSiO_4)(BO_3)$ in Caucasian skarn.

Lazic et al. (2011) Min.Mag., 75, 2631-2648.