

Bitikleite-(SnAl) and bitikleite-(ZrFe): New garnets from xenoliths of the Upper Chegem volcanic structure, Kabardino-Balkaria, Northern Caucasus, Russia

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ABSTRACT

Two new antimonian garnets—bitikleite-(SnAl) $\text{Ca}_3\text{SbSnAl}_3\text{O}_{12}$ and bitikleite-(ZrFe) $\text{Ca}_3\text{SbZrFe}_3\text{O}_{12}$ —have been found as accessory minerals in the cuspidine zone of high-temperature skarns in a carbonate-silicate xenolith at the contact with ignimbrites within the Upper Chegem structure in the Northern Caucasus, Kabardino-Balkaria, Russia. The bitikleite series forms a solid solution with garnets of the kimzeyite-schorlomite and toturite type. Antimony-garnets form crystals up to 50 μm across containing kimzeyite cores and thin subsequent zones of complex lakargiite-tazheranite-kimzeyite pseudomorphs after zircon. Bitikleite-(SnAl) has $a = 12.5240(2) \text{ \AA}$, $V = 1964.40(3) \text{ \AA}^3$ and bitikleite-(ZrFe) has $a = 12.49 \text{ \AA}$, $V = 1948.4 \text{ \AA}^3$ ($Ia\bar{3}d$, $Z = 8$). The strongest powder diffraction lines of bitikleite-(SnAl) are [d , \AA (hkl): 4.407 (220), 3.118 (440), 2.789 (420), 2.546 (422), 1.973 (620), 1.732 (640), 1.668 (642), and 1.396 (840)]. The strongest calculated powder diffraction lines of bitikleite-(ZrFe) are [d , \AA (hkl): 4.416 (220), 3.123 (440), 2.793 (420), 2.550 (422), 1.975 (620), 1.732 (640), 1.669 (642), and 1.396 (840)]. The Raman spectra of bitikleite garnets are similar to the spectra of kimzeyite and toturite. Larnite, rondorfite, wadalite, magnesioferrite, tazheranite, lakargiite, kimzeyite, and toturite associated with bitikleite garnets are typical of high-temperature ($>800 \text{ }^\circ\text{C}$) formation.

Keywords: Bitikleite-(SnAl), bitikleite-(ZrFe), new garnet, antimony, solid solution, single-crystal diffraction, Raman spectroscopy, Caucasus