American Mineralogist, Volume 103, pages 1699–1706, 2018

Stracherite, $BaCa_6(SiO_4)_2[(PO_4)(CO_3)]F$, the first CO_3-bearing intercalated hexagonal antiperovskite from Negev Desert, Israel

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Abstract

The new mineral stracherite, $BaCa_6(SiO_4)_2[(PO_4)(CO_3)]F$ [$R\overline{3}m$, $a = 7.0877(5)$ Å, $c = 25.201(2)$ Å, $V = 1096.4(1)$ Å^3, $Z = 3$], belongs to the zadovite group, which also includes zadovite, $BaCa_6[(SiO_4)(PO_4)](PO_4)_2F$; aradite, $BaCa_6[(SiO_4)(VO_4)](VO_4)_2F$; and gazeevite, $BaCa_6(SiO_4)_2(SO_4)_2O$. All minerals of this group exhibit single-layer antiperovskite modules, which are intercalated with tetrahedral layers. In stracherite, the first CO_3-bearing intercalated hexagonal antiperovskite, about 38% of the $(PO_4)^{3-}$ tetrahedra are randomly substituted by planar $(CO_3)^{2-}$ groups. The mineral was discovered in spurrite rocks of the Hatrurim Complex in the Negev Desert near Arad, Israel. Associated minerals are spurrite, calcite, brownmillerite, shulamitite, CO_3-bearing fluorapatite, fluormayenite-fluorkyuygenite, and ariegilatite. The empirical formula of stracherite is: $(Ba_{0.96}K_{0.02}Na_{0.01})_{\Sigma 0.99}Ca_{6.01}[(SiO_4)_{1.86}(PO_4)_{0.12}(AlO_4)_{0.01}(TiO_4)_{0.01}]_{\Sigma 2}[(PO_4)_{1.05}(CO_3)_{0.75}(SO_4)_{0.18}(VO_4)_{0.02}]_{\Sigma 2}(F_{0.95}O_{0.03})_{\Sigma 0.98}$. Poikilitic crystals of stracherite are up to 0.5 mm in size and are confined to re-crystallization zones of spurrite marbles under the influence of by-products (gases, fluids) of combustion metamorphism.

Keywords: Stracherite, zadovite group, new mineral, intercalated hexagonal antiperovskites, CO_3, Raman, pyrometamorphic rocks, Hatrurim Complex