Clinocervantite, $\beta$-Sb$_2$O$_4$, the natural monoclinic polymorph of cervantite from the Cetine mine, Siena, Italy

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Abstract: Clinocervantite occurs at the Cetine di Cotorniano mine associated with valentinite, tripuhyte, bindheimite and rosiaite. Clinocervantite, appearing generally as aggregates of single prisms elongated along [001] or twinned on {100}, is colourless, transparent, with vitreous lustre, biaxial, with the lowest measured refractive index $\alpha' = 1.72$ and the highest one $\gamma' = 2.10$. The strongest lines in the powder pattern are $d_{111} = 3.244$ Å and $d_{311} = 2.877$ Å. The crystal structure, space group $C2/c$ with $a = 12.061(1)$ Å, $b = 4.836(1)$ Å, $c = 5.383(1)$ Å, $\beta = 104.60(4)^{\circ}$ and $Z = 4$, has been refined to $R = 0.020$, confirming the new mineral to be the natural analogue of the synthetic $\beta$-Sb$_2$O$_4$ already known. The structures of clinocervantite and cervantite may be regarded as built up by stacking layers of nearly identical structure and composition accounting for both polytypism in the Sb$_2$O$_4$ compound and twinning of the clinocervantite crystals.

Key-words: clinocervantite, crystal-structure refinement, cervantite, twinning.

Introduction

During the study of rosiaite (Basso et al., 1996), an associated new mineral was found in material from the Cetine mine, central Tuscany, Italy. It is the natural Sb$^{3+}$/Sb$^{5+}$ oxide, corresponding to the synthetic compound $\beta$-Sb$_2$O$_4$ (Rogers & Skapski, 1964; Amador et al., 1988). The new mineral is the monoclinic modification of cervantite, $\alpha$-Sb$_2$O$_4$, (Gopalakrishnan & Manohar, 1975; Thorn- ton, 1977; Amador et al., 1988). Both mineral and its name have been approved by the Commission on New Minerals and Mineral Names of the International Mineralogical Association (ref. 97–017). Type material is preserved at the Dipartimento di Scienze della Terra, Sezione di Mineralogia, Università di Genova, Italy.

Occurrence, physical properties and chemical composition

Clinocervantite occurs in little cavities of a rock fragment found in the debris derived from mining operations, associated with valentinite, Sb$_2$O$_3$, tripuhyte, FeSb$_2$O$_6$, bindheimite, Pb$_2$Sb$_2$O$_6$-(O,OH) and rosiaite PbSb$_2$O$_6$. Clinocervantite appears as aggregates of crystals, elongated along [001], with prismatic habit. The crystals do not exceed 0.2 mm in length and often reveal polycrystalline twins. Clinocervantite crystals show slightly variable morphologies, the most common one being represented by the dominant prism {110} combined with subordinated {122} and {211} prisms (Fig. 1). The twin law corresponds to twin and composition plane {100}. 

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