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Determination of impurities in the surface of giant crystals of Naica by Synchrotron Radiation.

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Abstract content

Naica mine is located in the semi-desert region at the central-south of Chihuahua State, Mexico. The Giant Crystals Cave was discovered by accident in 2000 at Naica. This gallery has become world famous because of the size and purity of its selenite crystals [1]. This paper presents the use of synchrotron radiation phases identification in the crystal surface. All experiments were performed at Stanford Synchrotron Radiation Lightsource (SSRL). The X-ray absorption techniques of micro X-ray fluorescence (μ-XRF) and micro near edge absorption (μ-XANES) were measured at the beamline (BL) 2-3. Grazing incidence X-ray diffraction (GIXRD) experiments were performed at beamline 11-3.The μ-XRF and μ-XANES spectra and distribution maps were analyzed and processed with the "SMAK" [2] and "SIXpack" [3] programs, respectively. The interpretation of 2-D patterns was performed with programs ANAELU [4] and Wxdiff [5].The phases found in the impurities on the surface of selenite crystals are summarized as follows: a) selenite, galena, sphalerite, hematite and cuprite. b) Elemental distributions and correlations (0.6-0.9) for Cu, K, Fe, Mn, Pb, Zn, Ca and S were identified by μ-XRF. The correlations among elemental contents confirmed the phase identification, with the exception of manganese and potassium due to the amorphous nature of some impurity compounds in these samples. c) Amorphous compounds were suggested by the μ-XANES results. Plausibly, the manganese and lead elements form their respective non-crystalline oxides.
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Summary

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