

SYNCHROTRON RADIATION STUDY OF ALTERATIONS OF SELENITE GIANT CRYSTALS FROM NAICA, MEXICO

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Located in Chihuahua State, at Naica mine, lay two famous caverns: The Cave of Swords, which was discovered in 1910 and praised as early as in the year 1927 by Foshag in American Mineralogist, and the Cave of Giant Crystals, which was found in the year 2000. The last referred cave contains the largest gypsum single crystals in the world and is, therefore, the focus of recent articles. In the frame of a multi-institutional project about the effects of human action, alterations of the crystal structure are detected and impurities on their surfaces are identified. We have performed experiments using petrography, electron microscopy, conventional X-ray diffraction and, principally, synchrotron radiation techniques: diffraction in both transmission (T-XRD) and grating incidence (GI-XRD) modes, micro-X-ray fluorescence (?-XRF) and micro-X-ray absorption near edge structure (?-XANES). These experiments have been performed at the Stanford Synchrotron Radiation Lightsource (SSRL, USA), the ELETTRA Sincrotrone (Trieste, Italy) and at the European Synchrotron Radiation Facility (ESRF, Grenoble, France).

By GI-XRD we have observed that surface impurities may contribute to alter the mosaicity of single crystals. And, by all the three techniques, the representative impurities at the surface of the giant crystals were identified as hematite (Fe_2O_3), pyrolusite (MnO_2), sphalerite (ZnS) and galena (PbS). Several other phases, non-detectable by conventional techniques, were identified by ?-XRF and ?-XANES and are probably the product of natural adsorption on hematite, or other iron oxyhydroxides.

Our results suggest that the most important anthropogenic detriment on the crystals is the extraction of the water in which they were naturally submerged. Apparently, the surface of the crystals has not been significantly affected by human activity.

The support given by CONACYT Project No. 183706 and by SSRL, ELETTRA, ESRF synchrotron facilities is acknowledged. Authors are thankful to Cia. Peñoles and Naica Mine for providing samples.

Keywords: synchrotron radiation X-ray diffraction, micro-X-ray fluorescence, micro-X-ray absorption near edge structure

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