Poster Presentation

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Synchrotron radiation study of the surface impurities at Naica gypsum crystals

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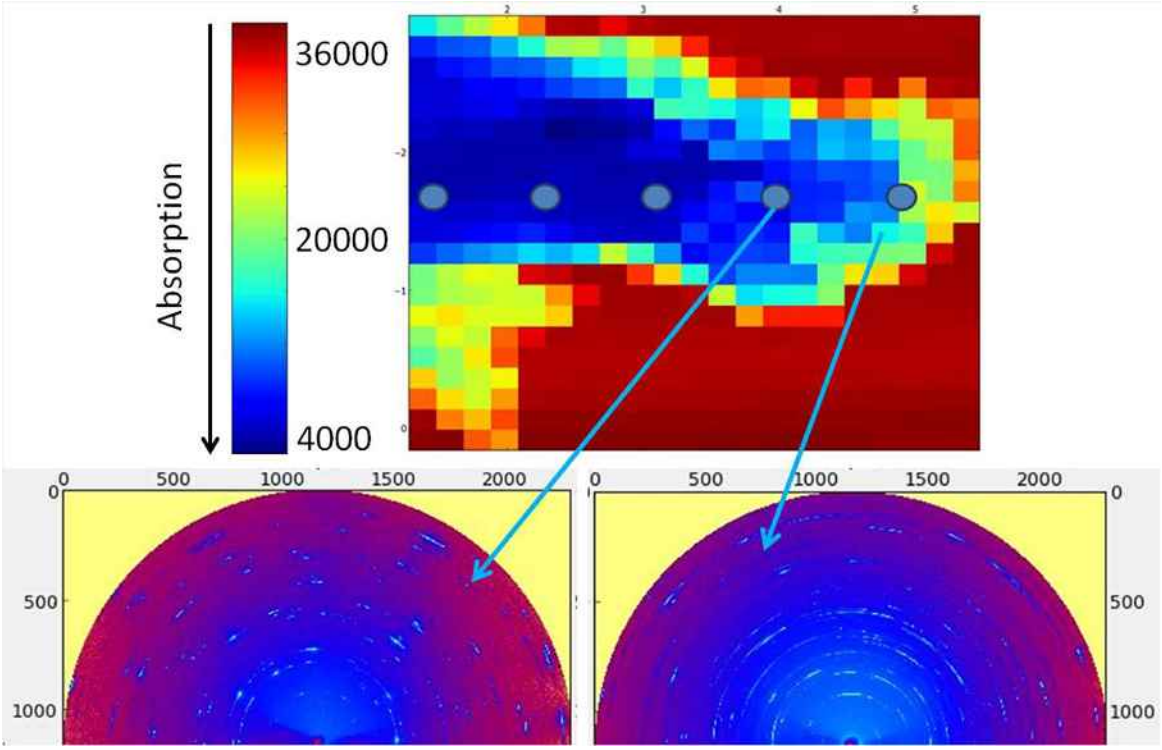
The Cave of Swords was discovered in 1910 at Naica mine, Chihuahua, Mexico. Its crystals now are 0.1-0.3m long and their surface is opaque and ocher. For over 100 years these crystals continue to amaze and give us clues about their formation [1]. This work refers to the use of synchrotron radiation for phase identification on gypsum single crystals surfaces (GSCS). The experiments were performed at beamlines (BL) 11-3 and 2-3 of the Stanford Synchrotron Radiation Lightsource (SSRL). Synchrotron X-Ray micro-Fluorescence (μ-SXRF) and micro-X-ray absorption (μ-XANES) at BL 2-3, as well as Grazing Incidence X-ray Diffraction (GI-XRD) and Transmission X-ray Microscope (TXM) at BL 11-3, were employed for elemental and phase identification. For μ-SXRF spectroscopy at the Pb LIII absorption edge some region of interests were selected on each sample. In some samples Fe K-edge μ-XANES spectra were obtained. Spectra from BL 2-3 were analyzed by standard procedures of in-house software tools and using SMAK [2]. Ni, Cu, Co, V, K, Ti, Fe, Mn, Pb, Zn, Ca and S elements were identified. Hematite phase was identified by μ-XANES. All GI-XRD and TXM 2D X-ray diffraction patterns (2D-XRD) were calibrated using standard procedures developed at BL 11-3. 2D-XRD data were analyzed by ANAELU [3], Wfdiff [2] and FindIt codes. Figure shows above a TXM image, mapping where 2D-XRD patterns were recorded. Impurities in the sample increase from left to right, as was observed by direct inspection. Below, 2D-XRD patterns show at left the single crystal spots and at right the mosaic tracks of gypsum crystals. It was concluded that the crystal structure is affected by impurities. Hematite, chalcopyrite, sphalerite, cuprite, galena, and alabandite phases were determined by GI-XRD at GSCS. Acknowledgment: Stanford Synchrotron Radiation Lightsource, Harvard Museum of Natural History and CONACYT CB-183706.

[1] *J. M. Garcia-Ruiz, R. Villasuso, C. Ayora et al. Geology 2007, 35, 327-330.,* ***[2]*** *SSRL web page (http://www-ssrl.slac.stanford.edu).,* ***[3]*** *L. Fuentes-Montero, M. E. Montero-Cabrera and L. Fuentes-Cobas, Journal of Applied Crystallography, 2011, 44, 241-246.*



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