SEM and μ-Raman characterization of electron beam damages on fluor-apatites : Implication for EPMA analysis.

Guillaume Wille, Ida Di Carlo, Abdeltif Lahfid

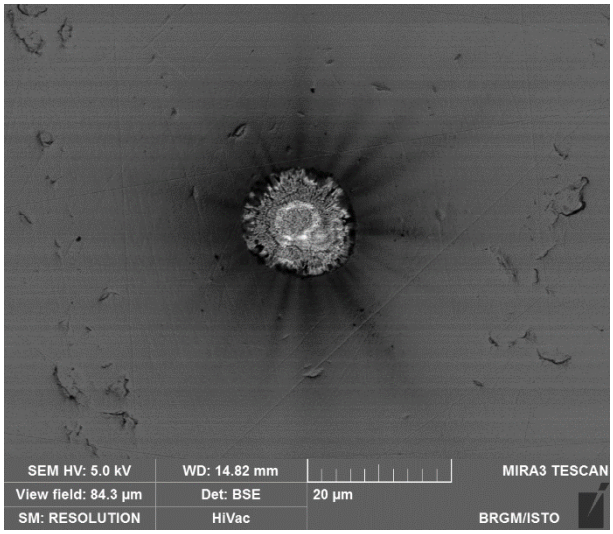
SEM AND µ-RAMAN CHARACTERIZATION OF ELECTRON BEAM DAMAGES ON FLUOR-APATITES - IMPLICATION FOR EPMA ANALYSIS

G. Wille[a,c], I. Di Carlo[b,c], A. Lahfid[a,c]
[a]BRGM, 3 avenue Claude Guillemin, P.O. Box 6009, FR-45060 Orléans Cedex 2, France
Université d'Orléans – CNRS/UMR7327 – INSU , 1A Rue de la Férollerie, 45100 Orléans, France
[c] UMR CNRS, Université d'Orléans, BRGM

Apatites are phosphate minerals of a general formula $Ca_5(PO_4)_3(OH,Cl,F)$. They areare the principal constituentof teeth andbone(natural and synthetic); represent an important accessory minerals in volcano geological environment by means as a storage of elements such as halogens, sulphates, carbonates, Sr and REE; represent a packagingof radionuclidesfor nuclear waste, trapping heavymetals andfinally are mostly used fertilizers.

This work is focused on fluorapatite, the Fluorine-rich composition. As mentioned by several authors, SEM and EPMA analysis of F-apatites is complicated by the strong consequences of electron beam damages. This problem is particularly strong for the determination of fluorine concentration. Indeed a complex intensity variation is observed for the fluorine signal collected by the spectrometer; this variation mainly depends on two parameters: crystal orientation of the mineral grain and electron beam setup.

Crystallographically-oriented Fluor-apatite were irradiated under the EPMA electron beam, using different setup (i.e. acceleration voltage, beam current, beam size) following the F, Ca and PWDS-variations signal. Beam damages were characterized by SEM and µ-Raman (including Raman-in-SEM).



SEM image of the damage caused by irradiation of a F-apatite with the electron beam oriented ∥ to the crystallographic c-axis.