Characterization of graphite alteration in an Uranium deposit by micro-Raman spectroscopy, X-ray diffraction, transmission electron microscopy and scanning electron microscopy

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Abstract. A series of graphitic samples associated with a uranium deposit has been studied by micro-Raman spectrometer, transmission electron microscopy, and X-ray diffraction. The dependence of the Raman spectrum on the orientation with respect to the laser beam is explained both from the structure of the tensor components associated with the different vibrational modes (E2g2 and defect bands) and from the analyzed volume by the spectrometer. Doubly polished thin rock sections, usually made for classical petrographic observations, are not suitable for Raman analysis because polishing damages the structural order of graphitic compounds.

A progressive and continuous but still small loss of structural ordering along the c axis is shown from both second order Raman spectra, interpreted by the model of Lespade and TEM measurements. Comparison with XRD data leads to the conclusion that the degradation of graphite occurs only on the surface and is probably linked with the alteration of its host-rock.

In addition to these defects, which were suggested by the variation of the reflectance, graphite leaves close to uranium concentrations exhibit hollow points with diameters up to several micrometers. Their characterization by TEM and Raman spectrometer has shown an amorphous structure of the carbon. They probably originate from a higher degree of graphite alteration.