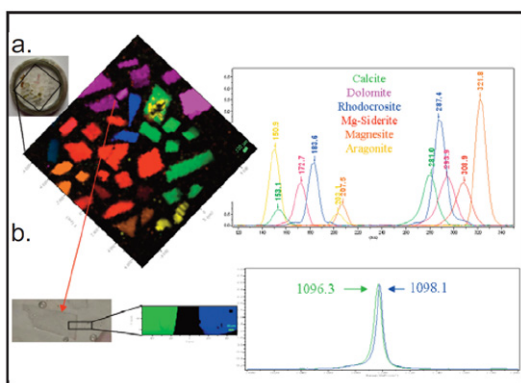


## Raman spectroscopy for geological applications

RENATA LEWANDOWSKA

HORIBA Scientific, 231 rue de Lille, 59650 Villeneuve d'Ascq, France, (renata.lewandowska@horiba.com)

Raman spectroscopy is a practical exploration tool to study geological materials. This technique is a rapid and reliable way to confirm a chemical composition of samples and the particle distribution. Chemical information can be obtained without any extraction procedure or sample preparation. Thus, the analysis can be achieved *in situ* and if necessary directly at the geological site. Raman imaging can be useful to study heterogeneous samples in various fields of application of Earth Science: mineralogy, gemmology, petrology, geoarcheology, paleontology, planetology or volcanology...



The latest developments in Raman instrumentation will be presented. A new Raman microscope will be introduced that combines high mobility, multi-laser excitation and ease-of-use. Its rugged design can withstand harsh environmental conditions for analysis in the field, and it is also equipped with a fiber port for probe measurements. We will also present a new imaging mode using scanning mirrors. This technique can be used in two modes: 'macro-mapping' mode to perform Raman imaging on large sample areas or for mapping small heterogeneities in large objects that cannot be moved easily with a motorized stage, such as big geological samples.

## Structural incorporation of uranium during the Fe(II)-induced transformation of ferrihydrite

JUAN S LEZAMA PACHECO<sup>1</sup>, MICHAEL S MASSEY<sup>2</sup>,  
F. MARC MICHEL<sup>1</sup>, JOHN R BARGAR<sup>1</sup>  
AND SCOTT FENDORF<sup>3</sup>

<sup>1</sup>SLAC National Accelerator Laboratory, 2575 Sand Hill Road, Menlo Park CA 94025 jlezama@slac.stanford.edu

<sup>2</sup>Department of Geological & Environmental Sciences, Stanford University, Stanford, CA 94305

<sup>3</sup>Department of Environmental Earth System Science, Stanford University, Stanford, CA 94305

Fe-(oxyhydr)oxides, among the most important metal-scavenging phases in soils and sediments, can undergo structural and compositional transformations during iron reducing conditions. Understanding the geochemical cycling and interaction of iron oxides with Uranium and other redox-active radionuclides, is of prime importance in the development of state-of-the-art biogeochemical models to understand the fate and transport of these hazardous elements. In this work, X-ray diffraction and EXAFS analysis have been used to characterize the transformation products and local atomic structure around uranium in synthetic iron-oxide phases obtained by the Fe(II)-induced transformation of ferrihydrite. After transformation of ferrihydrite, U(IV)-bearing compounds and Fe-oxides are observed, with U(V/VI) being structurally incorporated into multiple sites in the goethite structure. We will discuss the incorporation mechanism, in which adsorption of uranium on the ferrihydrite starting material plays a key role in incorporation of this radionuclide into the resulting crystalline iron oxide phases. Our work also suggests that bioremediation strategies such as biostimulation can drive U sequestration not only through direct reduction of U, but also through Fe redox cycling.