

## Combined probes for sub-millimetric investigations in aquatic sediments

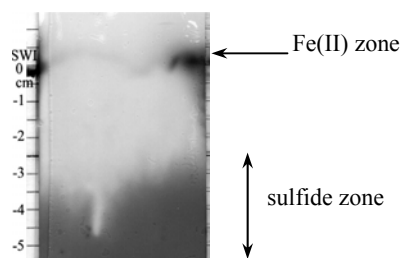
D. JEZEQUEL<sup>1</sup>, E. METZGER<sup>1</sup>, E. VIOLLIER<sup>1</sup>, F. PREVOT<sup>1</sup>,  
R. BRAYNER<sup>2</sup> AND F. FIEVET<sup>2</sup>

<sup>1</sup>Laboratoire de Géochimie des Eaux & IPGP  
(jezequel@ipgp.jussieu.fr)

<sup>2</sup>ITODYS Université Paris 7, France

Sediment-water interface (SWI) of aquatic environments is a very reactive zone involving strong gradients for dissolved compounds. Thin-films hydrogel techniques introduced in early 1990's by W. Davison are well adapted for 2D studies of such media.

We performed in a Mediterranean lagoon a new combined DET/DGT probe able to provide information both on iron and sulfide 2D distributions. After *in situ* deployment of the probe, a reactive soaked gel with Ferrozine is applied on the DET gel layer and a magenta color appears within minutes in rich ferrous iron zones. Sulfide distribution information is obtained with a DGT-like device : a PVC reactive film is located behind the DET layer in the probe. A gray coloration is obtained on the PVC film in the H<sub>2</sub>S rich zone of the sediment. Densitometry analysis after scanning allows to quantify Fe<sup>II</sup> distribution and get qualitative information of sulfide distribution (see figure).



For 1D investigations we have developed a double-side probe using a DGT for one face and a DET for the second face in order to compare Cd measurements with minors components, such as Fe and Mn, minimizing spatial effects in heterogeneous sediment. Trace elements are analyzed by ICP-AES, ICP-MS and GF-AAS. The DGT face can be analyzed by LA-ICP-MS to get 2D distribution of trace metals.

So, several combinations of thin-films and analytical techniques are possible, allowing to reach 2D trace elements distribution and the majors determining their behavior at a sub-millimetric scale.

### References

- D. Jézéquel, R. Brayner, E. Metzger, E. Viollier, F. Prévot and F. Fiévet, *accepted in Estuar. Coastal Shelf Sc.* (2005)  
E. Metzger, D. Jézéquel, E. Viollier, C. Simonucci, G. Sarazin and F. Prévot, *submitted to L&O methods*

## Tracing element zonation in garnet-peridotites by *in-situ* SIMS

B. MOCEK,<sup>1,2</sup> E. HELLEBRAND<sup>1</sup> AND D. IONOV<sup>1</sup>

<sup>1</sup>Max Planck-Institut fuer Chemie, Abteilung Geochemie,  
Mainz, Germany

<sup>2</sup>present address: Institut fuer Geowissenschaften, Universitaet  
Potsdam, Germany (bmocek@geo.uni-potsdam.de)

The aim of our study is the determination of new REE-distribution coefficients between cpx and grt from mantle-xenoliths (grt-peridotites), calculated from *in-situ* measurements with a secondary ion mass spectrometer (SIMS, upgraded Cameca 3f). Major element composition is measured in detail by the Jeol 8900RL electron microprobe. Until now most distribution coefficients were determined on grain-separates. These studies lack textural control. Whole grain analyses may contain micro-inclusions of different minerals or melts / fluids that disturb the results. The advantage of *in-situ* analyses is that petrological control on the grains and detailed petrographic investigations enables to avoid inclusions and altered parts of the minerals and detect zoning.

The oxygen beam of the used SIMS produces analysis spots of 15 to 20 microns, hence the spatial resolution of the technique is very good to detect spatial REE-variations within one single grain. By measuring selected REE-isotopes it is still possible to evaluate the overall REE-pattern of grt and cpx, while reducing the analysis time. To eliminate effects of molecular interferences which are not filtered by an energy offset, the steepness of the REE-pattern is used for the correction. Sensitivity factors were determined from international standards close to the chemical composition of the measured materials.

Our technique is also used to detect trace element variation within grains, because only unzoned grains indicating equilibrium should be used to calculate REE-distribution coefficients. With our setup it has been possible to determine REE-zonation in grt whereas major elements are unzoned (only minor Cr<sub>2</sub>O<sub>3</sub> variations between core and rim). These grt show minor but gradual enrichment in LREE from core to rim and in HREE from rim to core, respectively. However, coexisting cpx does not show complementary REE-zonation. Cpx and opx have major element variations which yield higher T and lower P rims. Xenolith entrainment in alkali-basalts caused reheating and decompression. Cpx rims recrystallized, grt broke down to kelyphite, and elements were redistributed. Due to slower diffusion cpx cores do not show the REE-zonation found in grt, new rims are strongly enriched.