	Experiment title: Impact of the size of the confinement on the ions distribution profiles in nanochannels	**Experiment number**: 32-02 797
Beamline: BM32	**Date of experiment**: from: 24/05/2017 to: 31/05/2017	**Date of report**:
Shifts:	**Local contact(s)**: TARDIF Samuel	*Received at ESRF:*

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Report:

The goal was to determine the impact of the size of the confinement on the ions distribution profiles at the planar parallel SiO_2 surfaces spaced of 2, 4 and 6 nm (nanochannels) in electrolyte solutions containing ions having more or less kosmotrope character using hard X-ray reflectivity. The electron density profiles obtained in such model systems will be compared to the one obtained by the atomistic modelling of these silica-based nanoconfinements filled with solutions in order to obtain the ions distribution and the charge surface.

Results and the conclusions of the study :

We have characterized the X-ray reflectivity of silica nanoconfinements (Ph.D of M. Baum between ICSM and CEA-MEM) **Erreur ! Source du renvoi introuvable.** filled of water and ions. We used a silica-based model system consisting in two parallel and plane surfaces spaced of 2, 4 and 6 nm (nanochannels) made by the CEA-LETI.

Samples will be first measured under vaccum at 200 °C in an oven and secondly, immersed in electrolyte solutions XCl_2 (with X = Ca^{2+}, Mg^{2+}, Ba^{2+}) at 0.2 and 1 M. Then, nanochannels will be placed in the previously used experimental set-up dedicated to the X-ray reflectivity measurement of samples in solution. X-ray reflectivity characterizations will be performed at 27 keV to allow transmission through the width of the sample (5 mm). All data will be recorded at 1 mm, 5 mm and 10 mm from the entrance of the nanochannels in order to determine an effect of the solution transport. An example of data collected on samples of 2, 4 and 6 nm are presented on Figure 1.

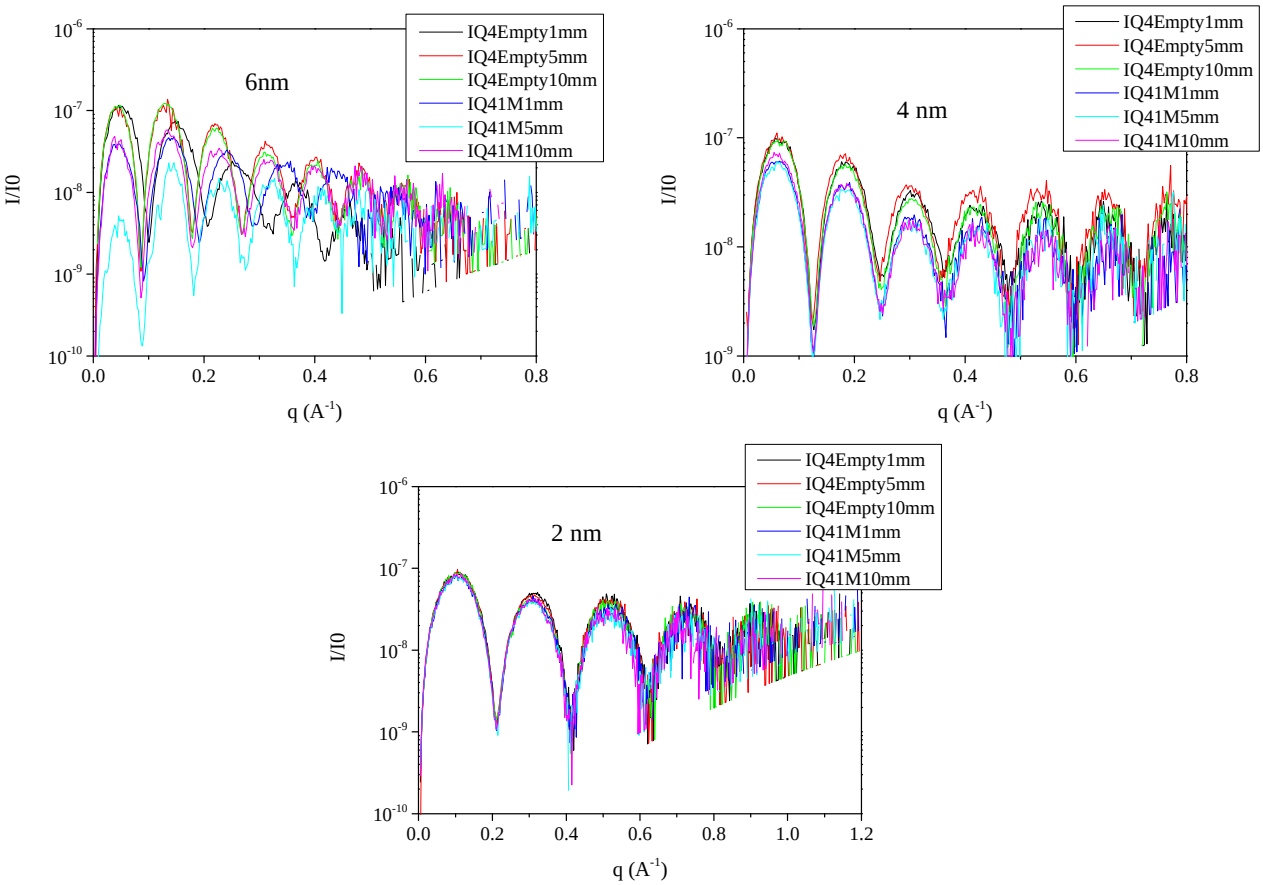

Figure 1: X-ray reflectivity data obtained on samples of 2, 4 and 6 nm in $BaCl_2$ solution at 1M.

Justification and comments about the use of beam time:

All the data were collected perfectly. However, the nanochannels having a 2 nm and 4 nm size were not completely filled after 1 month. Thus, one of the goals of the futur proposal is to determine the electron density profiles in these samples after few months of immersion in solutions. The second goal is to test the effect of pH on the ions distribution at the interface of silica in 2 and 4 nm nanochannels.

Publication(s):

- Baum, M. et al. Procedia Earth and Planetary Science (2017) 2017,Volume 17, 2017, Pages 682-685