	Experiment title: **Deciphering the role of periphyton in the fate of As in lake Titicaca**	**Experiment number**: EC 456
Beamline: BM30B	**Date of experiment**: from: 3 to: 8 nov 2016	**Date of report**: 21 Fev 2017
Shifts: 15	**Local contact(s)**: Olivier Proux	*Received at ESRF:*

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Report:

The periphyton is a biofilm composed of algae and bacteria covering the surfaces and plants in aquatic environments. It might play a key role in contaminant cycling thanks to its high sorption, accumulation and biotransformation abilities. We have evidenced a hyperaccumulation of As in the periphyton, in some areas of the lake Titicaca (Bolivia). Thus, this compartment might play a key role in the transfer of As to higher trophic levels. In parallel, one could take advantage of this accumulation for the removal of As from water in constructed weltands.

The purpose of this experiment was to identify the major accumulation and detoxification pathways, and to evaluate the stability and toxicity of As trapped in the periphyton. We have studied by As K-edge XANES spectroscopy a hyperaccumulating and non-accumulating periphyton collected on the lake. In addition, we have studied the non accumulating periphyton after 24h of incubation with 0.1 mg L-1 As^{III} and As^{V}, before and after EDTA extraction. EDTA is used to extract As present in the extracellular compartment.

Our plan was to freeze the samples in liquid N2 and transport in dry ice from Bolivia to Grenoble. After several unsuccessfull attempts, we decided to freeze dry the samples, and to record the spectra on these dehydrated samples. To evaluate the possible changes in As speciaiton due to freeze drying, a test experiment was done with periphyton from France, spiked with AsIII and AsV. We compared the spectra for frozen and freeze dried samples. As speciation was not altered by the freeze druing treatment (Figure 1). All spectra were recorded at 15 °K using a He cryostat, in fluroescence mode using the 30-element canberra detector.

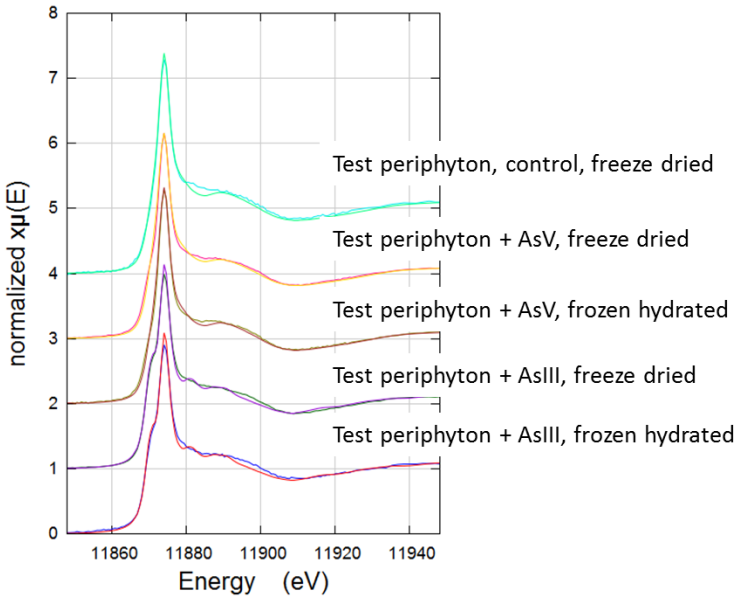

Figure 1: As K-edge XANES spectra for the test periphyton, freeze dried and frozen hydrated

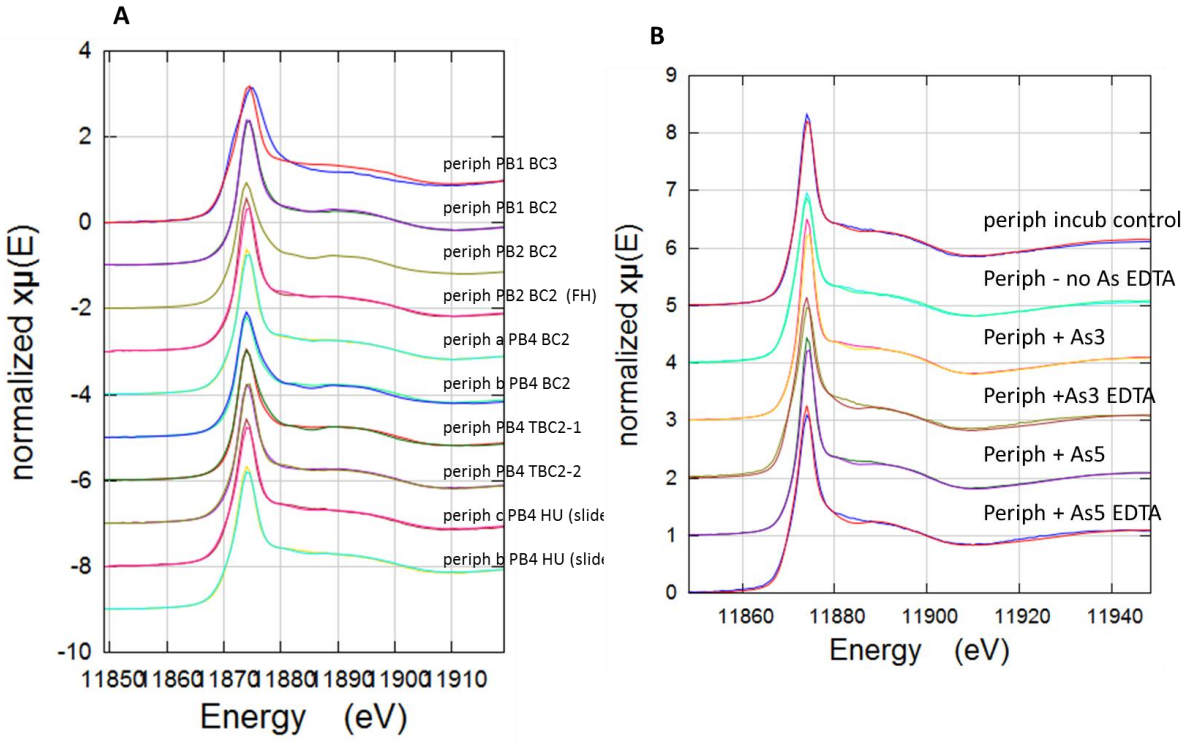

Figure 2: As K-edge XANES spectra for (A) the periphyton collected at different locations on the Titicaca lake - The "BC2" is the hyperaccumulating one, and (B) the periphyton from Hu, after incubation.

Figure 2 shows some representative spectra of the periphyton. For each sample, at least two replicates were analyzed. Spectra were treated by PCA and LCFs. Three As species were identified. EDTA extracted essentially one of these species. Data interpretation is underway. LCF results will be combined with elemental contents determined by ICP-AES.
Overall, the experiment was very successful. There was no beamtime loss. The support was perfect.