ESRF	**Experiment title:** Mécanisme d'hyperaccumulation du zinc chez *Arabidopsis halleri* Mechanism of Zn hyperaccumulation in *Arabidopsis halleri*	**Experiment number:** **30-02-20**
Beamline: BM30B	**Date of experiment:** from: 10 Nov 2002 to: 26 Nov 2002	**Date of report:** 25 Feb 2002
Shifts: 42**	**Local contact(s):** Olivier Proux and Xavier Bicquart	*Received at ESRF:*

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** : This beamtime concerns 5 experiments from the same laboratory, which have been grouped together: Experiments 30.02.01/16, 30.02.01/18, 30.02.01/19, 30.02.01/20, and 30.02.01/21.

Report:

The main proposer was in maternity leaves at the time of the experiment. The beamtime was used by the other users of the four experiments mentionned above.
Concerning the mechanisms of Zn hyperaccumulation in *Arabidopsis halleri*, an article has been published, based on EXAFS data obtained during previous experiments:
Sarret, G., Saumitou-Laprade, P., Bert, V., Proux, O., Hazemann, J. L., Traverse, A., Marcus, M. A. and Manceau A. (2002) Forms of zinc accumulated in the hyperaccumulator *Arabidopsis halleri*. *Plant Physiology* 130: 1815-1826.

Abstract

The chemical forms of zinc in the Zn tolerant and hyperaccumulator *Arabidopsis halleri* and in the non-tolerant and non-accumulator *Arabidopsis lyrata* ssp. *petraea* were determined at the molecular level by combining chemical analyses, extended X-ray absorption spectroscopy (EXAFS), synchrotron-based X-ray microfluorescence (µSXRF) and µEXAFS. Plants were grown in hydroponics with various Zn concentrations, and *A. halleri* specimens growing naturally in a contaminated site were also collected. Zn speciation in *A. halleri* was independent of the origin of the plants (contaminated or non-contaminated) and Zn exposure. In aerial parts, Zn was predominantly octahedrally coordinated and complexed to malate. A secondary organic species was identified in the bases of the trichomes, which contained elevated Zn concentrations, and in which Zn was tetrahedrally coordinated and complexed to carboxyl and/or hydroxyl functional groups. This species was detected thanks to the good resolution and sensitivity of µSXRF and µEXAFS. In the roots of *A. halleri* grown in hydroponics, Zn phosphate was the only species detected, and is believed to result from chemical precipitation on the root surface. In the roots of *A. halleri* grown on the contaminated soil, Zn was distributed in Zn malate, Zn citrate, and Zn phosphate. Zn phosphate was present in both the roots and aerial part of *A. lyrata* ssp. *petraea*. This study illustrates the complementarity of bulk and spatially resolved techniques, allowing the identification of (1) the predominant chemical forms of the metal, and (2) the minor forms present in particular cells, both types of information being essential for a better understanding of the bioaccumulation processes.