

Study of Selenium nanoparticles dissolution in environmental and human fluids

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To the best of our knowledge, very few is known about the properties and the biogeochemical behaviour of elementary selenium nanoparticles (Se^0), even if it concerns at least two main issues. Supplementation of food with Se^0 nanoparticles is used to cure selenium deficiency in several countries although Se^0 is known to be poorly soluble [1]. In the context of a deep geological waste repository, the speciation of selenium released from the waste packages to the biosphere, is still in debate. Indeed, Se^0 nanoparticles can be released directly by the geological waste repository or can arise from biotic and/or abiotic transformations of Se^{IV} and Se^{VI} species.

We used radio-labelled Se^0 nanoparticles in order to determine their dissolution properties in various pH solutions with or without O_2 .

Our results clearly shows that one of the main factor governing Se^0 nanoparticles dissolution is pH (figure 1).

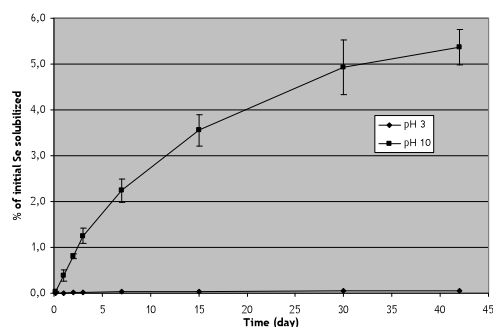


Figure 1: Dissolution of Se^0 nanoparticles as a function of pH

In order to explain Se^0 nanoparticles dissolution, we propose a stoichiometric equation taking into account H^+ and O_2 concentrations. Moreover, analysis of the surface state of nanoparticles are in progress to validate our equation.

[1] Bruggeman, C. *et al.* Selenite reduction in Boom clay: Effect of FeS_2 , clay minerals & dissolved organic matter. *Environmental Pollution*, (2005). **137**(2): p. 209–221.

High-resolution chemical analysis of ice cores by cryo-cell-LA-ICPMS: Implications for rapid climate change investigations

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High-latitude ice cores have become the master records of Pleistocene climate variability. Especially the high-resolution data from Greenland reveal a remarkably changeable glacial climate, and these rapid climate oscillations have recently been shown to take place within a few years only [1, 2]. The relative sequence of proxy records of dust, temperature or greenhouse gases allows identification of potential cause-effect relationships. For this to be successful, palaeoclimate information must be extracted at the highest possible, i. e. sub-annual, resolution.

We present a new technique for controlled *in situ* chemical analysis of ice cores at $<100 \mu\text{m}$ (0.1 mm) resolution, which focuses on seasalt and dust tracers. It utilizes a custom-built, peltier-cooled cryo-sample holder fully compatible with a two-volume Laurin LA-cell, in turn coupled to a Resonetics M-50 excimer LA system and an Agilent 7500cs ICPMS [3]. Using small strips of ice cores, this setup allows elemental concentrations to be acquired using both depth-profiling along chains of spots and/or as continuous lateral profiles. Seasalt or dust tracers such as Mg, Ca, Al have limits of detection in the low (est) ppb-range. This facilitates 1) subseasonal and/or longer-term element concentration variations to be detected and 2) location of chemical impurities in recrystallizing ice to be identified. As such, Dansgaard-Oeschger (DO) events can be analyzed at unprecedented resolution. Initial data for last glacial maximum NGRIP ice overall show annual variations in Mg and Al compatible with annual cyclicity but also remarkable small scale variability; data from longer glacial records will be presented.

[1] Steffensen, J. P. *et al.* (2008) *Science* **321**, 680–684.

[2] Thomas, E. R. *et al.* (2009) *Journal of Geophysical Research-Atmospheres* **114**, D08102. [3] Müller *et al.* (2009) *Journal Analytical Atomic Spectrometry* **24**: 209–214.