ESRF Experimental Report

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Proposal Title

Metallic inclusions in radio-tolerant green micro algae for environmental bioremediation

Experimental Team

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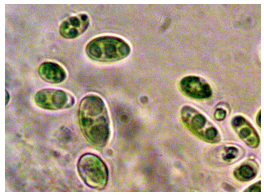
Samples (Biological)



Coccomyxa actinabiotis cells grown in metallic solutions (Ag, Co, Fe, Mn, Zn, Ni, U, Cr) cryo-fixed on a silicon nitride membrane (Si3N4).

Methodology

Samples have been initially observed using an optical microscope in order to select those alga cells relevant for the nano-fluorescence scanning. The beam size was about 130x100 nm size at 26 keV (Ag-K line).

Results

90 cell images were acquired during the experiment. The metal localisation depend on the oxidation state and toxicity. Most +II metals are distributed inside the cell, with a slight enrichment of the mucilage/membrane.

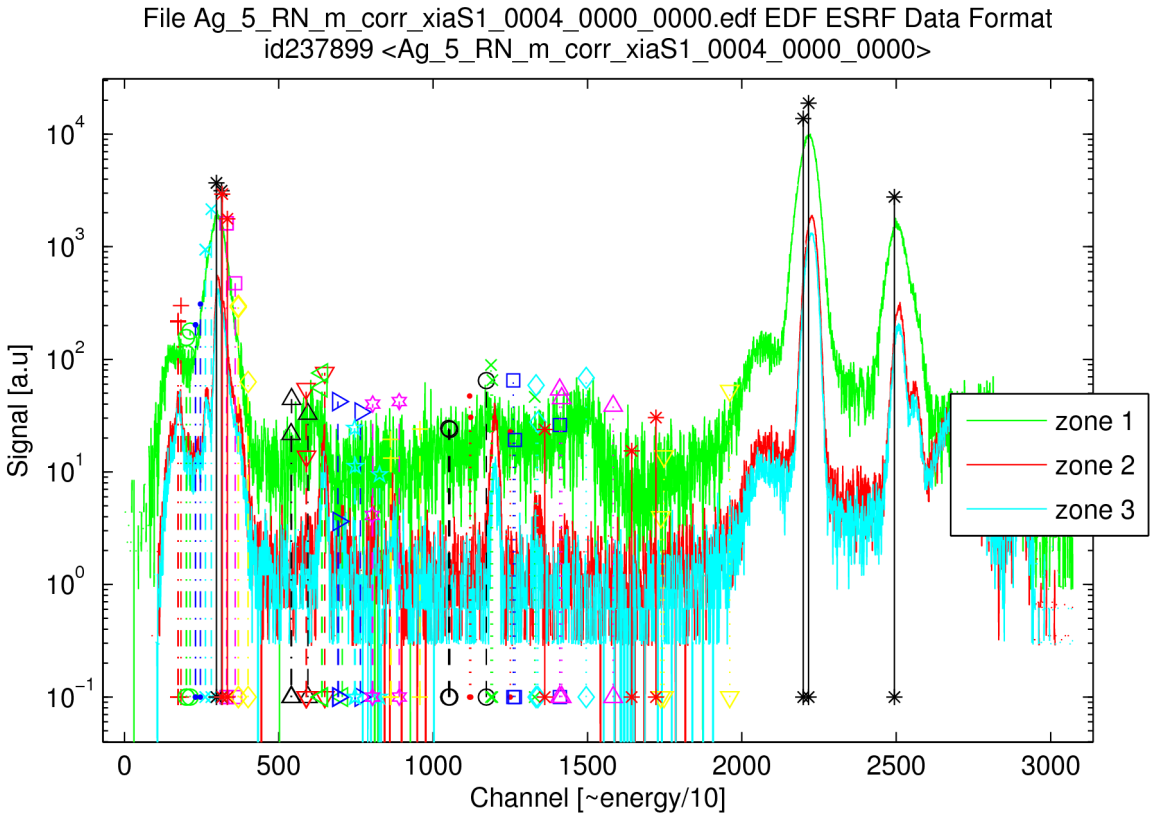


Illustration 1: Fluorescence spectrum for some regions of an alga cell enriched in a [Ag^+] = 10^{-5} M solution. The vertical lines indicate the energies of fluorescence K and L lines for a number of elements.

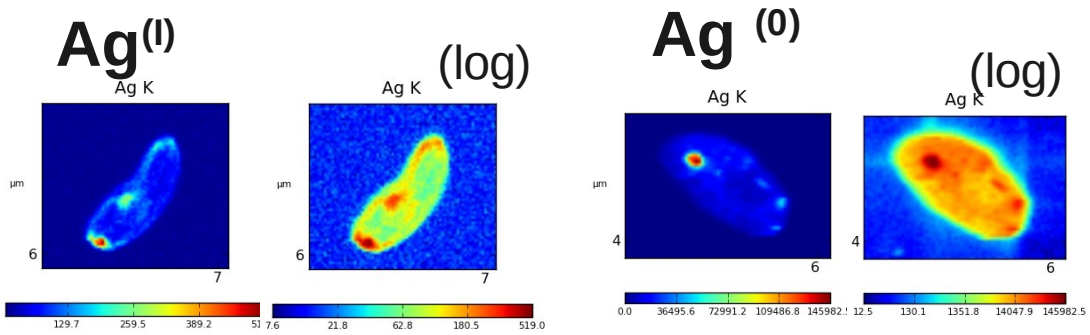


Illustration 2: Fluorescence Ag-K line images for two algae cells exposed to 10^{-6} M (left) and 10^{-2} M (right) silver solutions. The images are shown in linear and log intensity scale.

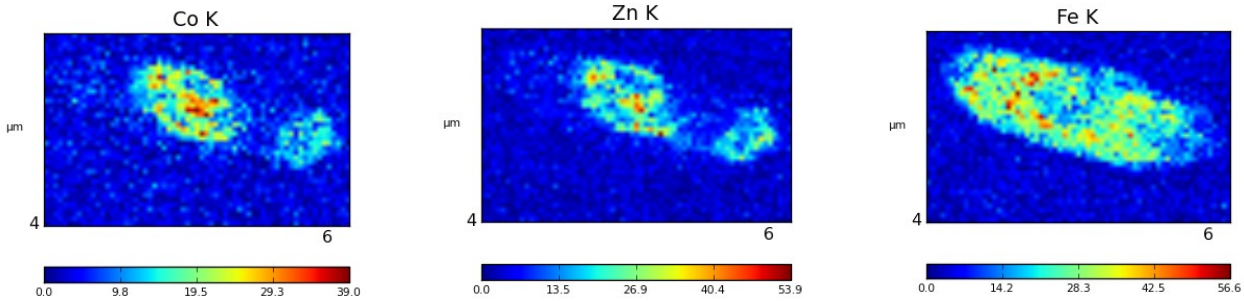


Illustration 3: Fluorescence Co Zn and Fe K-lines images for an alga cell exposed to 10-5 M metallic solution. The images are shown in linear intensity scale.