

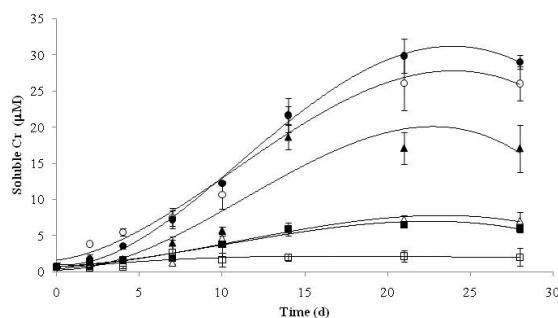
## Chromium hydroxide dissolution through abiotic and biotic processes

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Chromium contamination of the environment is of a major concern due to its extensive use in industrial processes. In most of basic and neutral environments, Cr (III) precipitates as stable hydroxides: Cr (OH)<sub>3</sub> and Cr, Fe (OH)<sub>3</sub> [1]. Yet, the production of organic ligands by plants or microorganisms can increase the dissolution of Cr (OH)<sub>3</sub> either by protons exchange or by the formation of soluble complexes [2, 3]. In order to evaluate the risk of Cr (OH)<sub>3</sub> heterotrophic leaching, several organic acids commonly found in the soil solution and a siderophore have been tested as a function of environmentally relevant pHs. The leaching ability of a siderophore-producing strain *Pseudomonas putida* GB1, was also tested in the presence of increasing concentrations of Cr (OH)<sub>3</sub>.



**Figure 1:** Soluble Cr from 1mM Cr(OH)<sub>3</sub> incubated with 100µM of (●) pyoverdine (○) citric acid (▲) oxalic acid (△) gluconic acid (■) tartaric acid (□) and no ligand, in 5mM Na-acetate buffer at pH 5.0, as a function of time.

The mobilization of Cr from Cr (OH)<sub>3</sub> by the organic ligands was pH-dependent in a range of 5.0-8.0. Pyoverdine (Pvd) was one of the most efficient chelating agent, along with citric acid for pH 5.0-7.0, while Pvd was the only efficient ligand at pH 8.0. Maximum mobilization occurred at pH 5.0 with a maximum rate of 2.0 µM Cr/day and 2.1 µM Cr/day for citric acid and Pvd respectively (Fig. 1). The production of Pvd by *P. putida*, which is stimulated by the increasing concentration of Cr (OH)<sub>3</sub>, enhanced Cr mobilization up to 1.3 µM Cr/day. Further studies will assess the combination effect of organic acids and Pvd on Cr (OH)<sub>3</sub> leaching.

[1] Bosecker (1997) *FEMS Microbiol. Rev.* **20**, 591–604.

[2] Rai *et al.* (1989) *Sci. Total Environ.* **86**, 15–23.

[3] Carbonaro *et al.* (2008) *Geochim. Cosmochim. Acta* **72**, 3241–3257.

## High resolution functional group mapping of fungi on a mineral surface

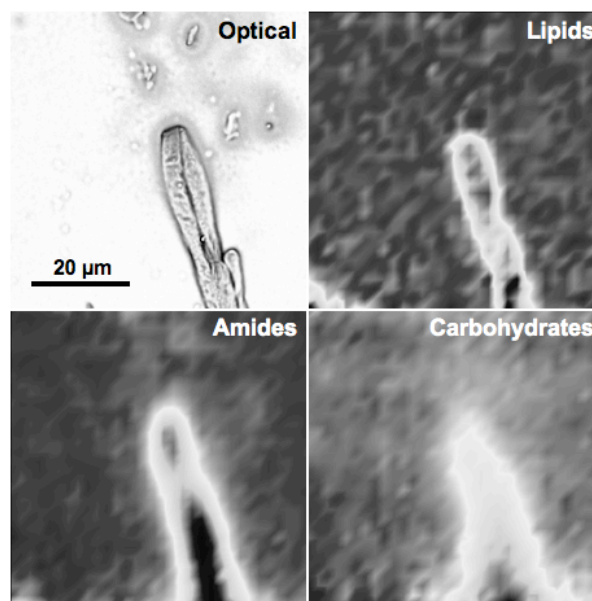
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Root-plant symbiotic fungi (mycorrhiza) forage for ‘food’ in soils by acting as biosensors and discriminating between different mineral nutrient sources. Mycorrhiza strongly adhere to mineral surfaces where they form vast networks of microscopic filaments. Here we investigated the distribution of organic functional groups in single fungal hypha at high spatial resolution (Fig. 1). Hyphae extracted from *in situ* biotite weathering experiments were mapped using synchrotron-based µ-FTIR with Focal Planar Array (FAP, 1.03µm<sup>2</sup>/pixel on sample) capabilities. The maps below show marked differences between the spatial distribution of lipids, amides and carbohydrates along a hypha, revealing a link between functionality and composition. This data provides new insight into the changes of physiology of hypha through their interaction with a mineral substrate.



**Figure 1:** Optical and corresponding FAP maps of *Paxillus involutus* fungi, grown in symbiosis with a *Pinus sylvestris* tree on a biotite substrate.