

## Applying bacterial metallophores to mobilize gallium

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Metallophores are produced by many organisms such as bacteria, fungi and plants in order to mobilize metals, especially iron (Greek: “siderophore” = iron carrier), to overcome limitations or stress. Respectively, it is well known these compounds loaded with relevant metal ions are used not only by the producing organism but also by others. Thus metallophores as metal carriers are relevant for many processes at various habitats (e.g. metal acquisition, pathogenic factors, antimicrobial activity, sensing). However, metallophores do also mobilize metals of industrial interest which have no critical role in the living world. Here we focused on gallium as industrial relevant metal and compared it to iron which is important for all organisms. The herein described mobilization of valuable metals such as gallium from soils provides first hints towards alternative strategies, such as phytomining, sensor development, or solvent extraction based on metallophores.

Two produced metallophore preparations of soil bacteria (*Gordonia rubripertincta* CWB2 and *Paracoccus denitrificans* PD1222) and the commercially available metallophore desferrioxamine B were analyzed for iron binding activity by means of a standard chromazurol S assay and equal iron binding activities were employed to treat a soil sample. The pH was set constant to 6 in order to avoid pH related effects. Therefore, the metallophore was prepared in a special medium and control of water and medium were also applied onto the soil. The soil was washed and incubated with the mentioned preparations. The mobilization of iron and gallium was determined prior and after the treatment by means of ICP-MS. Water showed no effect and medium only a little on metal mobilization which is related to its ionic strength. All metallophores mobilized iron at a similar strength but showed significant differences in case of gallium. Here the metallophore mix produced by strain CWB2 showed best results and allowed to mobilize gallium 3-times better than pure desferrioxamine B. This clearly demonstrates metallophores have various affinities and such a kind of soil treatment allows selectively mobilizing metal ions of interest. We aim to broaden the study to more industrial but also life relevant metals.