Bioaccumulated metals in native plants from the mining area of Rodalquilar (South Spain)

M.G. BAGUR-GONZÁLEZ[1,6]* S. MORALES-RUANO[2,6] F.J. MARTÍN PEINADO[3], C. ESTEPA-MOLINA[4] AND J. CARRILLO-ROSUA[5,6]

[1]Anal. Chem. DepUniv. Granada. Spain (*correspondence: mgbagur@ugr.es)
[2]Min & Petr. Dep. Univ. Granada. Spain (smorales@ugr.es)
[3]Soils Science Dep. Univ. Granada. Spain (fjmartin@ugr.es)
[4]Min & Petr Dep. Univ. Granada. Spain (carmenem@ugr.es)
[5]Education Faculty. Univ. Granada. Spain (fjcarril@ugr.es)
[6]IACT. Univ. Granada-CSIC. Spain

The Rodalquilar gold mining district (Almería, south Spain) is an abandoned mining area extensively exploited since roman age up to the end of last century. Different types of metallic mineralizations appear in the zone, related with volcanic rocks, usually in the form of sulphides or native elements. As consequence of the extraction of metals (Au, Pb, Zn, Cu, etc.), important volume of dumps waste had been generated.

In this work, the effect of the mining activity on native and cultivate plants (twenty one classes) was monitored determining the content of twelve elements (As, Ba, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, V, and Zn). A data matrix constructed with the recollected samples has been subjected to different Pattern Recognition techniques such as Hierarchical Cluster Analysis, and Factor Analysis in order to study the behaviour of the samples in relation with their bioaccumulation effect. On the other hand, two bioaccumulation factors have been estimated, one (defined as 'bioaccumulation plant/soil factor' -closely related with the type of anthropogenic origin-), and other (defined as 'bioaccumulation plant/paste saturate extract' – closely related with the soluble in water forms of the elements analysed). It can be concluded that, in the most of the cases the plants show good metal accumulation behaviour (beneficial for decontaminating heavy metals from polluted soils) although in some cases an exclusion strategy for metal tolerance has been developed for the specimen.

Sorption and biomineralization of Uranium by a microbe

M.H. BAIK* AND S.Y. LEE

Korea Atomic Energy Research Institute, 150 Deokjin-dong, Yuseong-gu, Daejeon 305-353, Rep. of Korea

An experiment for the sorption and biomineralization proceeses of uranium was carried ou using *Shewanella p.*, iron-reducing bacterium. Almost all of the dissolved uranium (VI) in a simulated groundwater with an initial concentration of 50 mM was removed by the microbe (8 mg/L) within 16 days. The uranium (VI) was found to be sorbed onto the microbial surface and then reduced into U (IV) and biomineralized into different uranium solid phases such as uranite and ningyoite depending on grounwater composition.

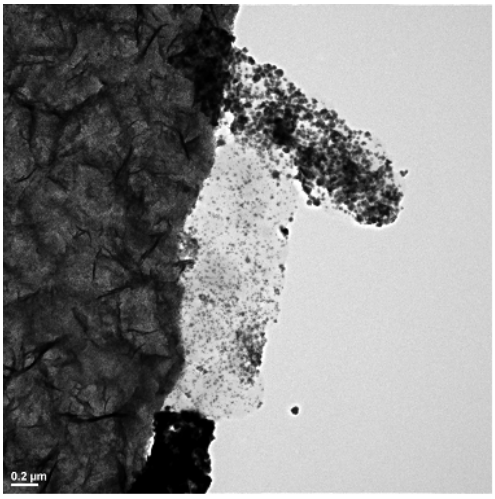

Figure 1: Biomineralization process of uranium and growth of the uranium particles.

In a considered solution composition (1.0 mM $CaCl_2$, 1.0 mM KCl, and 1.0 mM $MgCl_2$), uranite mineral was formed by the biomineralization. When phosphate (0.3 mM Na_3 $(PO_4)_2$) was added into the solution, on the other hand, a ningyoite mineral (CaU $(PO_4)_2 \cdot H_2O$) was formed. The biomineralized urnaium with an initial size of 2-3 nm was eventually enlarged to several μm sizes by combining with individual microbes and organic exudates [1]. Thus it is revealed that the iron-reducing bacteria can reduce the mobility of uranium (VI) by sorption and biominerization in subsurface enviornments.

[1] Senko *et al.* (2007) *Geochim. Cosmochim. Acta* **71**, 4644–4654.