Nanoscale study of the growth of (010) gypsum surface in the presence of Cr(VI)

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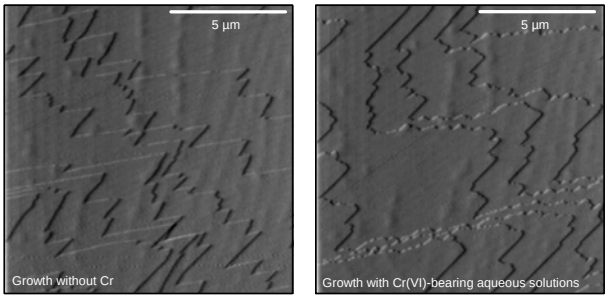
Cr is a major metal contaminant whose concentration in surface waters and soils can reach values that constitute a threat to public health. The toxicity of Cr is strongly dependent on its valance, which determines its mobility. Most Cr(VI) compounds are very soluble. Consequently, Cr(VI) is much highly mobile and bioavailable than Cr(III), and more toxic. Thus, Cr(VI) is considered to be a carcinogenic, even at low concentration. For this reason, the presence of a certain amount of Cr(VI) in concrets has become an important environmental issue. The reactions that occur during the ageing of concrets can cause the release of this pollutant. It has been demonstrated that such a release is strongly promoted by the presence of sulphate in the concret, i.e. when its gypsum content is high. Studying the proccesses involved in the interaction between gypsum surfaces and Cr(VI)-bearing aqueous solutions can help to understand the mechanisms of Cr(VI) release.

Here, *in situ* AFM experiments were conducted at a temperature of 25°C to study the effect of Cr(VI) on the growth of the (010) gypsum surface under different supersaturation conditions. Measurements on series of AFM images provide quantitative information, which demonstrates that the presence of Cr(VI) in the aqueous solution has kinetic and morphological effects on the advancing steps. Thus, Cr(VI) reduces the spread rate of the steps on (010) gypsum surface. Moreover, it modifies their roughness, changing from straight to jagged steps, and, finally, promotes steps' merging, leading to the stabilization of new directions.



This work is part of the project CGL2007-65523-C02-01 (Spanish Ministry of Science and Innovation).

Evaluation of mining polluted areas using multivariate statistical approaches: The case of gold mines in the South of Spain

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The Rodalquilar gold mining district (Almería, south Spain) is now an abandoned mining area in which different types of metallic mineralizations appear related with volcanic rocks, usually in the form of sulphides or native elements. As consequence of the extraction of metals (gold, lead, zinc, copper, etc.), important volume of dumps waste are generated, which in contact with air and rainwater could cause acid drainage.

In this work, the effect of the mining activity on waters was monitored determining the content of eleven elements (Mn, Ba, Co, Cu, Zn, As, Cd, Sb, Hg, Au and Pb). A data matrix constructed with the water samples recollected in Rodalquilar mining district has been subjected to different Pattern Recognition techniques such as Hieralchical Cluster Analysis (HCA), Principal Component Analysis (PCA), Factor Analysis (FA) and Linear Discriminant Analysis (LDA) in order to identify different sources of environmental pollution caused by the abandoned mining industry. The Box-Cox transformation has been used to transform the data set in normal form in order to minimize the non-normal distribution of the geochemical data. Unsupervised pattern recognition methods, as HCA, grouped samples into four clusters. PCA and FA confirm this fact, particularly, FA has been allowed to identify different sources of environmental pollution caused by the abandoned mining industry. It can be concluded that the environmental impact is affected mainly by the mining activity developed in the zone (related with the levels of Cd, Zn, Cu, Pb, Co and As found in the analysed waters), the acid drainage (related with the levels of Ba, As, Co, and Mn in waters) and finally, by the chemical treatment (related mainly with the levels of Hg and Au found) used for the benefit of gold (typically amalgamation with mercury or cyanidation). At last, the use of LDA as a supervised pattern recognition method has permit to obtain a discriminant function which generates "grouping scores" from those it is possible to confirm the natural grouping obtained previously.