

GOLD ADSORPTION ON GOETHITE AND HUMIC ACID COATED GOETHITE. Tosiani T. , Instituto de Ciencias de la Tierra, Universidad Central de Venezuela, Aptdo. 47509, los Chaguaramos 1041-A, Caracas, Venezuela. ttosiani@strix.ciens.ucv.ve.

Natural organic matter (NOM) in surficial or ground water exists as a variety of molecular sizes and complex mixture of polyfunctional organic compounds. Adsorption of these organic compounds onto inorganic colloids can alter the physicochemical properties of the solid. Although many classical adsorption models have been developed, little consideration has been given to desorption modeling, so that in environmental systems it may be inappropriate to consider a completely reversible or irreversible reaction [1].

Increasing evidence attests that various physical and chemical processes can mobilize and redistribute gold on surface environments. Dissolution of elemental gold with the aid of many inorganic and organic ligands, and subsequent transport and deposition in response to changes in various physicochemical parameters has been extensively studied. Adsorption of gold is probably an important process in determining the extent of gold mobilization and secondary dispersion in natural environment. Previous studies related with the adsorption of gold complexes on many mineral surfaces have been carried out, some more recent are related on the adsorption of Au on goethite [2]. However in the nature the presence of humic acids in soils and natural waters, play an important role on change the surface characteristics of these iron oxi-hydroxides. The objective of this preliminary study was to verify and extend the previous studies by investigating the adsorption of Au(III)-chloride by goethite and NOM coated goethite.

The humic acids used in these experiments come from the Paragua River (Venezuela), extracted using successive freezing and later liophilization [3]. The goethite was synthesized starting from ferric nitrate and potassium hydroxide at 60°C during 8 days, resulting a well crystallized goethite with a surface area of 20 m²/g. The experiments of adsorption of humic acids on the goethite indicate a maximum adsorption of 2.5 mg C/m² at pH 4-5 with a very high histeretic behavior, where the desorption is very small being a final concentration of 2.2 mg C/m² (fig.1). The goethite color is ocher, and after the adsorption of the humic acids it takes a brown coloration in spite of the successive washing with water. The adsorption of humic acids is more efficient at pH=2, while at pH=10-12 the adsorption is almost null.

The adsorption of gold (AuCl₄⁻) was measured in suspensions of pure goethite and coated goethite, both to a concentration of 0.5 g/L, at pH=4.0-4.5 with an ionic strength of NaNO₃=0.01 N. The results indicate a

enhanced capacity of gold adsorption from 4 to 6 times when the goethite is coated with humic acids (fig.2)

In conclusion, the high adsorption and the histeretic behavior of NOM on the goethite at pH=4-5, especially in tropical regions, could be the common surface characteristic of these oxi-hydroxides, and this property may contribute to enhance the secondary dispersion of gold near ore mineral deposits.

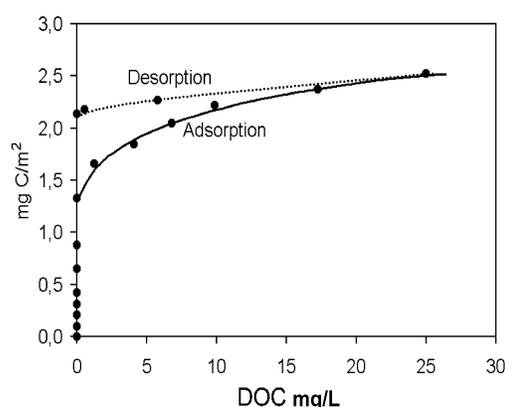


Figure 1.- Humic acid adsorption and desorption on goethite (20 g/m²) at pH=4-5 and NaCl=0.01 N.

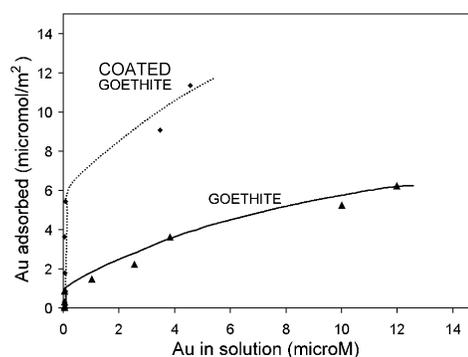


Figure 2.- Gold adsorption on goethite and goethite coated with NOM, at pH=4.0-4.5 and NaNO₃= 0.01 N.

References: [1] Boahua G. et al. (1995) *GCA*, 59, 219-229. [2] Machesky L. et al. (1991) *GCA*, 55, 769-776. [3] Martinez E. and López E.C. (1995) *Proceeding of III Int. Cong. Of Energy, Envir. And Tech. Innovation*, 293-298.