Raw and thermally modified diasporic bauxite as an effective binder of Pb in aqueous solutions.

Maria-Anna Gatou*[1], Ariadne Argyraki*[1], and Vassilis Zotiadis[2]

[1]University of Athens (UOA) – Greece
[2]Edafomichaniki SA – Greece

Abstract

Bauxite, the major aluminum ore, has been assessed in recent years for its efficiency in the adsorption of potentially harmful elements and especially As, both in soil and aqueous environments. In the present study a series of laboratory batch experiments have been performed to assess the effectiveness of raw and thermally modified diasporic bauxite for Pb(II) removal from standard aqueous solutions. Grainy bauxite samples were subjected to heat treatment, at temperatures of 105, 350, 450 and 800 ∘C for 4 hours. Mineralogical analysis by X-ray diffraction (XRD) and Scanning Electron Microscope analysis were conducted before and after heat treatment. The study of Pb removal efficiency of both raw and heat-treated material, was performed for adsorbent doses from 2g/L to 15g/L, initial metal concentration of 50mg/L, maximum shaking time of 1.5h at pH=4. The effect of ionic strength was studied by varying the concentration of NaNO3 from 0mol/L to 0.5mol/L. All experiments were carried out at 22 ∘C. The raw material consists mostly of the minerals diaspore, gibbsite, and boehmite mixed with the two iron phases goethite and haematite, the clay mineral kaolinite and small amounts of anatase. Haematite is enriched in the samples from the temperature of 350 ∘C and diaspore turns into corundum before the temperature of 800 ∘C. Despite the observed mineralogical transformations the most effective concentration of bauxite, which leads to maximum removal of Pb from the solution, is 10g/L. An abrupt increase in solution pH was observed and 100% Pb removal was achieved after 90 minutes. A decrease in adsorption was observed as the concentration of NaNO3 was raised, probably due to competition between Na+ and metal ions for available adsorption sites. The results suggest that the Pb removal, is mainly controlled by precipitation facilitated by pH increase and the porous texture of the material.

*Speaker