

Comparative study of As and Sb in soil and Phosphogypsum waste

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Arsenic (As) and antimony (Sb) are metalloids that belong to the same chemical group, sharing similar physicochemical and toxicological properties [1]. They both have high toxicity with great carcinogenic potential, being in USEPA priority pollutants list [2,3]. Antimony is less widely distributed in the environment, and thus, understudied. Nevertheless, its increasing use in human activities and its high risk to human health has gained the worldwide attention. Arsenic and Sb are mostly found in +3 and +5 oxidation states, with the former being more toxic [4, 3]. Their oxidation state is a major factor affecting their mobility in aquatic systems [3], which is larger for As(+3), but lower for Sb(+3), compared to (+5) species.

In this presentation we will compare their redox reactivity in alluvial mollic fluvisol and in phosphogypsum (PG) waste. The phosphate fertilizer industry is responsible for the stack-piling of acidic PG wastes worldwide, highly enriched in both As and Sb. Here, we focus on the PG wastes of the Huelva Estuarine system (Spain), stack-piled on marsh soils, containing elevated concentrations of both contaminants compared to other similar systems [5]; the concentrations of As and Sb are up to 45mg/L and 0.5 mg/L, respectively [6], while their limit concentrations in water are 0.01 mg/L and 0.006 mg/L, accordingly [3].

In redox-oscillation reactors the net mobilisation of As during reducing periods and Sb during oxic periods is observed for the soil sample [7], but not for the marsh soil below the PG waste [8], pointing out to the phosphate competition for redox active surface sites. Results performed with nanomagnetites will be discussed with respect to this competition.

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