Abstract #10524

Abstract Title: As(V) scavenging from artificial and real wastewaters by mineral-derived Mg/Al and Mg/Fe LDH materials

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Abstract Text:

The contamination of water with arsenic has become a worldwide emerging problem. Among a wide range of arsenic removal methods, there is a limited number of approaches suitable for the removal of its anionic forms including As(V). Adsorption by solid state materials gained popularity as effective and relatively cheap technique. The inorganic adsorbents, including mineral-based materials, gained popularity due to their low price and affinity towards As(V). Layered double hydroxides (LDHs) called anionic clays are promising anion-exchangers. They have the following general formula: $[M^{II}_{1-x}M^{III}_{x}OH_2]^{x+}[A^{n-}]_{x/n} \cdot yH_2O$, where M^{II} is a divalent metal, M^{III} is a trivalent metal and A is an anion. The octahedra comprising metals build the positively-charged brucite-like layers. The layer charge is balanced with the intercalated hydrated anions which are easily exchangeable. LDHs can be easily obtained in the laboratory as their presence is rare in geological environments. Moreover, the final cost of the LDH adsorbent may be lowered by substitution of chemical reagents with selected minerals which are abundant and widely applied in the industry. Therefore, in this work, magnesite, dolomite, halloysite, and hematite were used as sources of M^{II} and M^{III}. Their dissolution allowed to obtain solutions containing appropriate metals, which were further used for the co-precipitation of LDHs of Mg/Al and Mg/Fe chemistry. A series of materials was obtained, where minerals or chemicals served as precursors of metals. The materials were tested in adsorption experiments in various conditions including initial As(V) concentration, initial pH, adsorbent dose and the presence of coexisting anions. The results of the experiments showed a high, however diverse affinity of the obtained LDH materials towards As(V). The As(V) was effectively removed from both artificial and natural waters, however, the removal rate was affected by the presence of sulphates. Although the efficiency of As(V) removal from aqueous solutions by LDHs strongly depends on their parameters, the LDHs derived from minerals are promising candidates for As(V) scavenging from wastewaters.

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