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Removal of heavy metals from simulated wastewater by in situ formation of layered double hydroxides

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Abstract.

Heavy metal removal from wastewater is an important environmental issue. Sorption by layered double hydroxides (LDHs) and precipitation in alkaline media are two of the main remediation techniques for these pollutants. Here, both processes are compared, with emphasis on the mechanisms involved and the solids obtained as residues. A heavy metal ion solution with high sulfate concentration was used as a simulated wastewater. It was treated with a carbonate-containing Mg-Al LDH to study sorption processes, while alkalization in the presence of Mg²⁺ ions was used to produce LDH in situ precipitation. The removal capacity of these processes was analyzed and the solids obtained upon remediation were characterized by PXRD patterns and FT-IR spectra. The obtained results were related to the removal mechanisms, the solubility products of heavy metal hydroxides and their capacity to produce LDH phases. High Cu²⁺ removal capacities were obtained in all cases, while those of Pb²⁺ and Zn²⁺ ions depended on the remediation procedure and factors such as Mg²⁺ ions concentration and final pH. Apart from Pb²⁺ ions, the heavy metal precipitated as LDH phases, which

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