Effect of heat treatment on the catalytic activity of CuMgFe-LDH for Fenton degradation

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Layered Double Hydroxides (LDHs) have been shown to be promising catalysts in Fenton process and offers several advantages such as high synergism between the structural cations present in 2D lamellae, low toxicity, high porosity, thermal/chemical stability, low leaching of metals, and simplicity of synthesis [1]. The objective of this research is to investigate the effect of heat treatment on LDHs for application as catalyst for heterogeneous Fenton process. Initially, LDH of the pyroaurite-type was prepared based on the coprecipitation method using Cu(II), Mg(II), and Fe(III) cations, and CO_3^{2-}as interlamellar anion [2]. The synthesized LDH was separated for treatment at 400 ^{o}C and 650 ^{o}C. To evaluate the catalytic activity of the materials, degradation experiments were performed with 300 mL of 200 µg L^{-1}sulfamethoxazole (SMX) at room temperature and in dark conditions. According to XRD and XPS analyzes, after heat treatment the LDH was transformed into Mixed Metal Oxides (MMOs) with spinel cubic structure. However, according SEM images, the stacks of layers presented in the LDH containing the cations remained even after treatment. In addition, the catalyst treated at 400 ^{o}C presented significant absorption up to 600 nm, which is an interesting feature for solar photo-Fenton application. The SMX degradation efficiency with MMOs was lower when compared to LDH, however, showed negligible leaching. The catalytic efficiency and stability at near neutral pH, make LDH a potential candidate for Fenton application.

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