Removal of Cl^- from WFGD Wastewater by Electrocoagulation using Layered Double Hydroxide Compounds as Granule Electrodes

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Wet flue gas desulfurization (WFGD) wastewater contains a considerable amount of Cl^- , which can cause equipment and pipeline corrosion and even reduce desulfurization efficiency. An electrocoagulation (EC) process with three-dimensional electrodes, consisting of layered double hydroxide (LDH) compounds as granule electrodes and Fe as plate electrodes, was adopted to remove Cl^- from WFGD wastewater. Two kinds of layered double hydroxide compounds, ZnAl-NO_3 layered double hydroxides (LDHs) and MgAl-CO_3 calcined layered double hydroxides (CLDHs), were comparatively investigated as granule electrodes and coupled with an EC process. The feasibility and effectiveness of layered double hydroxides as granule electrodes for Cl^- removal were proven by X-ray diffraction (XRD) and Fourier transform infrared (FTIR) characterization. The morphology and thermal stability of the layered double hydroxides were further demonstrated by means of scanning electron microscopy (SEM) and thermogravimetry (TG). When ZnAl-NO_3 LDHs were used as the granule electrode, the removal efficiency of Cl^- reached 84.19% at an electrode spacing of 1 cm, a current density of 444 A/m^2 , and an electrolysis time of 20 min. When a MgAl-CO_3 CLDH granule electrode was used, the removal efficiency of Cl^- reached 83.78% under an electrode spacing of 1 cm, a current density of 333 A/m^2 and an electrolysis time of 20 min. Cl^- removal was enhanced by the coupling of the EC process with adsorption by layered double hydroxide compounds.

Keywords: Flue gas; Desulfurization wastewater; Chloride; Layered double hydroxides; Electrocoagulation

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