Enhanced removal of Hg （ II ） ions from desulfurization wastewater by EDTA functionalized graphene oxide complexes

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Abstract: Graphene oxide (GO) is a new promising nanometer material in superconductor and wastewater heavy mental ions removal for its functionalized groups. Ethylenediaminetetraacetic acid functionalized graphene oxide complexes (EDTA-GO) was produced by a realizable silanization chemical reaction. Characteristics of Hg(II) removal in desulfurization wastewater was also under investigation. The chemical composition and microstructures of the EDTA-GO adsorbents were characterized by Scanning Electron Microscopy(SEM), XPS and Raman spectroscopy analyses. To investigate the performance of EDTA-GO adsorbents on adsorption of Hg(II) in wastewater of wet flue gas desulfurization(WFGD), experiments were performed to optimize the main influence factors such as reaction temperatures, pH values, contact time, initial Hg(II) concentrations and adsorbent doses. The maximum uptake removal efficiency (93.39%) was achieved under the optimal conditions at pH 7, 70 °C, Hg(II) concentration 800 μg/L and EDTA-GO dose 40 mg/L. The kinetics models of adsorption and thermodynamics fitting of Hg(II) ion adsorption on EDTA-GO were also studied. The kinetic data fitting results were well consistent with the pseudo-second-order model and a spontaneous and endothermic adsorption reaction was elaborated by thermodynamics studies ($\Delta G<0$, $\Delta H>0$, $\Delta S>0$). The experiments of recycled adsorbents by HCl generation were carried out to obtain the performance of the reused EDTA-GO adsorbents, the fourth regenerative adsorption efficiency still maintained 80.4%, which indicated that excellent potential application in desulfurization wastewater treatment.

Key words: EDTA; Graphene oxide; Mercury; Kinetics; Adsorption isotherm; Regeneration