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Adsorption behavior of phenol by reversible surfactant-modified montmorillonite: Mechanism, thermodynamics, and regeneration

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ABSTRACT

Organomodified montmorillonite (MT) has been considered as a potential adsorbent for the removal of organic pollutants from wastewaters. However, high cost and secondary pollution of regeneration for the adsorbent limit the further application in organic wastewater treatment. To address this problem, the adsorbent of MT modified by reversible surfactant [(11-Ferrocenylundecyl) trimethyl ammonium bromide (FTMA)] (FTMA-MT) was prepared, and the reversible characteristic and the adsorption mechanism of FTMA-MT for phenol as a representative were investigated. Cyclic voltammetry experiments demonstrated that FTMA-MT represented a good electrochemically reversible characteristic. Comparison of the oxidation state of FTMA-MT, reductive FTMA-MT manifested prominent adsorption capacity that was higher compared to that of MT modified by traditional surfactants with the similar carbon chain length. The mechanism for the adsorption can be attributed to partition. The adsorption process was spontaneous and conformed to the pseudo-second-order kinetics. The desorption from FTMA-MT can be achieved by the electrochemical control switching its reduction state and oxidation state, and the desorption efficiency was up to 65%. Even after five cycles, the adsorption amounts of FTMA-MT for phenol were comparable with those of the traditional surfactants-modified MT. This is the first to report the adsorption behavior for phenol using reversible surfactant-modified MT, and this study also provides an innovative

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