

Calcined Iron Rich Clay as an Adsorbent and a Photocatalyst for the Degradation of Phenol

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Abstract

This study investigates the potential of a calcined iron rich clay for the removal of phenol from aqueous solutions (adsorption) and subsequent degradation of the adsorbed phenol (photocatalysis). The calcined clay contains 21.47 % wt of α -Fe₂O₃ which is a well known visible light responsive photocatalyst. Adsorption data were analyzed using the Langmuir and Freundlich isotherm models, as well as the pseudo-first-order and pseudo-second-order kinetic models. Adsorption of phenol on the calcined iron rich clay is best described by the Pseudo-second-order kinetic model and the Langmuir isotherm model. The adsorption capacity of the calcined iron rich clay for phenol was found to be higher than the reported capacity of bentonitic clay. Photocatalytic degradation of phenol using the calcined clay obeys pseudo-first order kinetic model. The apparent rate constants (k_{app}) of the photocatalytic degradation of phenol using the calcined iron rich clay are higher than the reported k_{app} for the photocatalytic degradation of phenol using TiO₂. The calcined iron rich clay can be used to treat phenol containing wastewater via adsorption and photocatalysis.

Key words: Adsorbent, Photocatalyst, Phenol, Calcined iron rich clay, Degradation

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