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A novel peat-based biosorbent for the removal of phosphate from synthetic and real wastewater and possible utilization of spent sorbent in land application

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ABSTRACT

Removal of potentially harmful phosphorus compounds from wastewater by adsorption onto biosorbents is a cost-effective alternative to the conventional treatment methods. Raw peat and peat modified with iron(III) hydroxy ions were used in this study to remove phosphate ions from synthetic solution and household wastewater. Interaction of iron(III) ions with carboxylic groups of peat occurred during peat modification, which was confirmed by the FTIR technique. The effect of the initial phosphate concentration, pH, contact time, temperature, and ionic strength was studied in batch experiments. It was found that the sorption capacity increased with the increasing temperature, i.e. the maximum sorption capacity of the modified peat was 9.64 mg P/g at 2°C and 11.53 mg P/g at 40°C, respectively, indicating the endothermic nature of the sorption. Besides, the Langmuir equation was used to describe the sorption isotherms quantitatively. Given that the spent biosorbent did not exhibit phytotoxicity and the concentration of heavy metals did not exceed the limit values, the phosphate-saturated modified peat may be utilized as an organic fertilizer in agricultural land application.

Keywords: Adsorbent; Biosorption; Peat; Phosphate; Recovery; Removal; Sorption; Wastewater

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