

Removal of ammonia nitrogen, nitrate, phosphorus and COD from sewage wastewater using palm oil boiler ash composite adsorbent

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ABSTRACT

Sewage treatments are introduced in the country to protect the health of human and environment. In this study, palm oil fuel ash (POFA) was explored as an adsorbent media for the treatment of a sewage wastewater. The optimum shaking speed, shaking time, pH, and dosage for chemical oxygen demand (COD), ammonia nitrogen, nitrate and phosphorus removal were investigated using the adsorbent media of particle sizes ranging from 2.00 to 3.15 mm. POFA and composite POFA chemical composition and characteristics were then determined. Results indicated that sewage concentrations of COD (63.39 mg L⁻¹), ammonia nitrogen (6.01 mg L⁻¹), nitrate (0.63 mg L⁻¹) and phosphorus (0.43 mg L⁻¹). The optimum conditions for shaking were determined at 200 rpm according to the adsorption of COD, ammonia nitrogen, nitrate and phosphorus by the media. Optimum shaking time of 20 min for ammonia nitrogen, nitrate phosphorus and COD optimum shaking time is 30 min. The optimum pH value for COD, nitrate and phosphorus removal using composite POFA was obtained at pH 6 and for ammonia nitrogen is pH 9. Microstructures of the prepared composite POFA were analyzed using Brunauer–Emmett–Teller, scanning electron microscope, X-ray diffractometer and X-ray fluorescence measurements. These results suggest that composite POFA can be used as a potential effective, low cost and eco-friendly green adsorbent for the removal of COD, ammonia nitrogen, nitrate and phosphorus from sewage wastewater.

Keywords: Palm oil fuel ash (POFA); Adsorption; Physico-chemical analysis; Microstructure; Element analysis

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