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Removal of phenolic compounds from olive oil mill wastewater using kaolinite and iron oxide nanoparticles

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ABSTRACT

In this study, effective, inexpensive, sustainable, and environmentally friendly adsorbents composed of iron oxide nanoparticles immobilized on kaolinite were used to remove phenolic compounds from olive mill wastewater (OMW) in Jordan. Two phenolic compounds (tyrosol and p-hydroxybenzoic acid) were selected as models for phenols present in OMW. The best adsorbent was acid-activated kaolinite mixed with iron oxide nanoparticles with a ratio of 1:20. This mixture gave removal efficiencies up to 81.8% and 97.3% for tyrosol and p-hydroxybenzoic acid, respectively. Investigation of adsorption at different conditions showed that the best adsorption was at pH of 3, a temperature of 25°C, an adsorbent dose of 2.5 g/100 mL OMW, and the equilibrium was established after 3 h. Also, a new efficient high-performance liquid chromatography (HPLC-UV) method was developed for the determination of the target phenolic compounds in OMW. The new method showed satisfactory validation results in terms of linearity, precision, recovery, the limit of detection and limit of quantitation.

Keywords: Wastewater treatment; Adsorption; High-performance liquid chromatography; Kaolinite; Olive mill wastewater; Phenols; Nanoparticles

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