

Ionic liquid modified magnetic nanoparticles-graphene hybrid ($\text{Fe}_3\text{O}_4\text{@GO-IL}$) for the removal of ibuprofen and penicillin G from aqueous solutions

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ABSTRACT

Pharmaceutical compounds with a toxic nature are released into the aquatic environment and can lead to adverse effects on ecological sustainability. Thus, enhancing the separation and treatment of the toxic compounds seem necessary. In this study, uptake and removal efficiency for the adsorption of two pharmaceutical compounds, ibuprofen (IBU) and penicillin G (PEN G), from aqueous solutions by $\text{Fe}_3\text{O}_4\text{@GO-IL}$ were investigated. However, the effect of main effective variables including pH, concentrations, adsorbent dosage, and contact time were investigated. Isotherm and kinetic models also were studied. The maximum IBU removal rate was achieved about 97.58 (~5 mg/g) under optimal condition, pH 6.5, adsorbent dose 0.120 g/L, contact time 60 min, initial concentration 12.7 mg/L. At a condition of pH 4, adsorbent dose 0.3 g/L, contact time 97.5 min, initial concentration 32.43 mg/L, the maximum PEN G was 95% (9.14 mg/g). The Freundlich and Langmuir isotherms and pseudo-second-order models gave the best-fit to equilibrium experimental adsorption data. The findings of the study showed that new modified magnetic nanoparticles-graphene using ionic liquid (ILMNP) can use as a high potential, simple, rapid separation, and re-generable material for adsorption pharmaceuticals.

Keywords: Adsorption; Magnetic nanoparticles; Graphene oxide; Ibuprofen; Penicillin G

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