ABSTRACT

The study clarifies this hydrogel's potential for treating pharmaceutical wastewater. The composition of the hydrogel, which contained chitosan, polyvinyl alcohol (PVA), and Halloysite Nano-clay, was investigated using Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), and kinetic models. Significant alterations in the hydrogel's different vibrational modes and absorption bands were found in the results, indicating that the Halloysite Nano-clay had been functionalized effectively. The highest removal efficiency was achieved in 140 minutes at a concentration of 40 mg/L, pH = 7.5, and an adsorbent dosage of 0.1g (CPH-3). As initial levels increased, OTC adsorption rose to 99%.Additionally, employing a hybrid hydrogel film based on chitosan and PVA, a maximum removal effectiveness of 95% for oxytetracycline was attained in 60 minutes with an initial concentration of 20 mg/L and an adsorbent dosage of 0.1g. Chemisorption mechanisms outweigh physical adsorption, according to the kinetic modeling of OTC adsorption onto a variety of adsorbents (CP-1 to CPH-6). The adsorption behavior is better represented by the pseudo second-order model, which shows the importance of adsorption in the process. Additionally, employing a chitosan-based hydrogel film, a maximum removal efficiency of 98% for oxytetracycline was attained with an initial concentration of 40mg/L, an adsorbent dosage of 0.05g, and an ideal temperature of 25°C for 60 minutes. For oxytetracycline adsorption isotherm analysis, the pseudo-second-order (R2 = 1) and Langmuir (R2 = 0.998) models offer the best fit. The maximal monolayer adsorption capacity of the chitosan-based hydrogel was 645.1 mg/g, as per the Langmuir isotherm model. These results suggest that oxytetracycline adsorption was mostly caused via chemisorption.