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ADSORPTIVE REMOVAL OF AMOXICILLIN USING MONTMORILLONITE BARIUM TITANATE NANOCOMPOSITE IN AN AQUEOUS MEDIUM

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Amoxicillin, one of the most widely used antibiotics in Sri Lanka, significantly contributes to antibiotic resistance upon discharge into natural water bodies. This emerging concern over antibiotic resistance is expected to impose substantial financial burdens globally in the foreseeable future. Among various methods, adsorption has gained significant attention for antibiotic removal. Among the leading materials for wastewater adsorption, montmorillonite (MMT) emerges as one of the most widely used adsorbents due to its high surface richness and nanolayered structure. In this study, barium titanate (BT), a ferroelectric substance with a polar surface having positive and negative charges, was selected as a potential material for synthesizing nanocomposite with MMT for amoxicillin removal. Four nanocomposites were synthesized by doping MMT with varying percentages of BT (2,4,6 and 8%). The nanocomposites were characterized using fourier transform infrared (FT-IR), powder X-ray diffraction (PXRD), scanning electron microscopy (SEM), and thermogravimetric analysis (TGA) techniques. In addition isothermal studies were conducted. SEM images confirmed the presence of BT nanoparticles layered on the surface of the MMT. The adsorption experiments conducted with 25 ppm amoxicillin samples revealed that the synthesized nanocomposite exhibited enhanced amoxicillin adsorption as the dosage of BT increased from 2% to 8%. The pH study indicated a positive correlation between the adsorbance and pH value, with the average pH value of 7.55 in the hospital effluent falling within a favourable range for adsorption. The isothermal study results were inconclusive due to the presence of nanoparticles in the final test sample for absorbance, which affected the absorbance readings and the overlapping absorbance peak of MMT with that of amoxicillin. Despite these challenges, overall findings suggest that the nanocomposite holds great potential as an effective adsorbent for removing amoxicillin from hospital effluent water. Overcoming the challenges encountered during the isothermal study and optimizing nanocomposite holds promise for the efficient removal of amoxicillin.

Keywords: Adsorption, Antibiotic resistance, Amoxicillin, Barium titanate, Montmorillonite