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CIPROFLOXACIN REMOVAL USING SEPIOLITE-BASED ADSORBENTS

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Ciprofloxacin (CIP) as a broad-spectrum quinolone antibiotic is extensively used in daily life and can be detected in municipal and pharmaceutical wastewaters, as well as natural waters. In this study, natural mineral sepiolite (SEP), SEP modified with hexadecyltrimethylammonium-bromide (HDAB) and SEP composites with graphene oxide (GO) were used as adsorbents for the removal of CIP from aqueous solutions. The composites were prepared at a mass ratio SEP to GO of 2 : 1, using SEP and SEP modified by [3-(2-aminoethylamino)propyl]trimethoxysilane (APT). Thermogravimetric analysis, X-ray diffraction and nitrogen adsorption-desorption were used to characterize the obtained adsorbents. The adsorption of CIP was investigated at the pH value close to pH of natural waters. The concentration of CIP in aqueous solution was determined by UV-Vis spectroscopy. GO showed the highest adsorption capacity (~ 150 mg/g). The capacity of SEP was about 60 mg/g, while the SEP modification with HDAB has led to a decrease in the adsorption capacity (~ 35 mg/g). The composite SEP/GO showed the higher adsorption capacity (~ 110 mg/g) than the composite SEP-APT/GO (~ 40 mg/g). The capacity of the composite SEP/GO was higher than of mixture of SEP and GO, which indicated a certain degree of GO exfoliation and intercalation of sepiolite particles, as it was shown by X-ray diffraction. Equilibrium data for all adsorbents, except for HDAB modified sepiolite, fitted well to the Langmuir isotherm model.

Keywords: Adsorption, Ciprofloxacin, Sepiolite, Graphene oxide

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