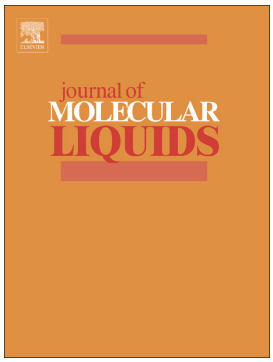

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Ciprofloxacin adsorption onto different micro-structured tourmaline, halloysite and biotite

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ABSTRACT

The extensive use of fluoroquinolones (FQs) antibiotics has resulted in their prevalence and subsequent antibiotic resistance, and then FQs have received increasing attention as one of the major contaminants in the environment. In present study, three minerals with different micro-structures including tourmaline (cyclosilicate), halloysite (silicate nanotubes) and biotite (sheet silicate) were utilized to remove ciprofloxacin (Cip), a second generation of FQs. Three adsorbents were firstly well characterized to reveal their micro-structures and compositions by combination of scanning electron microscopic (SEM) and transmission electron microscope (TEM) technologies, X-ray diffraction (XRD), X-ray fluorescence (XRF) microscope and Brunauer-Emmett-Teller (BET) analysis, and subsequently, a systematical investigation was performed to study their adsorption performance to Cip, by varying the initial pH (2.0-10.0), contact time (0-300 min), initial concentration (0-50 μg/mL), ion strength (1 mM and 10 mM NaCl/$CaCl_2$). Finally, the desorption and reusability properties were evaluated. The experimental results indicate that compared with cyclosilicate tourmaline and sheet silicate biotite, the nanotube structured halloysite shows the highest adsorption ability, with the saturated adsorption capacity of 21.7 mg/g for Cip at the equilibrium time of 60 min. The presence of monovalent Na^+ will promote the adsorption,

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