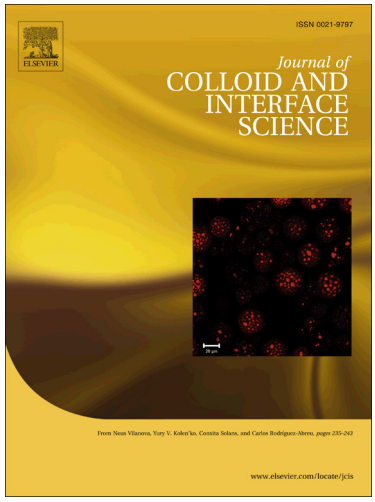

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Interfacial thermodynamics and kinetics of sorption of diclofenac on prepared high performance flower-like MoS_2

Zhang Yalei[1], Yin Zengfu[1], Dai Chaomeng[*2], Zhou Xuefei[1],Chen Wen[1]

[1] State Key Laboratory of Pollution Control and Resource Reuse, College of Environmental Science & Engineering, Tongji University, Shanghai 200092, China; [2] College of Civil Engineering, Tongji University, Shanghai 200092, China

ABSTRACT

Flower-like MoS_2 with numerous wrinkled nanosheets was prepared via a facile hydrothermal method. The surface morphology and microstructure of the obtained materials were characterized using X-ray diffraction data (XRD), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). Additionally, the compositions of the flower-like MoS_2 were further revealed by an energy dispersion spectrometer (EDX) and X-ray photoelectron spectrometry (XPS). The obtained MoS_2 was used as an adsorbent to remove diclofenac (DCF, $C_{14}H_{10}Cl_2NO_2Na$) from aqueous solutions and presented excellent performance for removing DCF. The sorption kinetics, isotherms and effect of solution pH on the sorption were evaluated in batch sorption experiments. The sorption characteristics of the interactions between DCF and MoS_2 in water were analyzed using a pseudo-second-order model, an intraparticle diffusion model and Boyd model to determine the sorption rate-determining steps. It was concluded that the sorption of DCF on MoS_2 was fitted better by the pseudo-second-order model and that external diffusion governed the sorption process of DCF onto the MoS_2. The interfacial interaction free energies between DCF and MoS_2 in the sorption process can be calculated based on the extended Derjaguin−Landau−Verwey−Overbeek (XDLVO). The flower-like MoS_2 presenting excellent performance for removing DCF, could be a better choice of treating DCF-containning wastewaters.

Keywords: MoS_2; Diclofenac; Sorption; kinetics