

Anti-crushing millimeter composite beads for removing 2,4-dichlorophenoxyacetic acid from aqueous solution

Sheng Feng^{a,*}, Xianglin Huang^a, Guiliang Zhu^a, Wei Zheng^a, Cong Shao^a, Ning Zhou^b

^aSchool of Environmental and Safety Engineering, Changzhou University, Jiangsu 213164, China, Tel. +86-519-86330080; emails: shfeng@cczu.edu.cn (S. Feng), xianglhuang@163.com (X.L. Huang), zhuguiliang940606@qq.com (G.L. Zhu), ZW17862930738@163.com (W. Zheng), CongShaoCCZU@outlook.com (C. Shao)

^bSchool of Petroleum Engineering, Changzhou University, Jiangsu 213164, China, email: zhouning@cczu.edu.cn

Received 19 December 2018; Accepted 24 July 2019

ABSTRACT

The millimeter composite bead with enhanced crush resistance, UiO-66/chitosan@UiO-66 (UCU), can be fabricated by depositing UiO-66 nanoparticles on the surface of bead. In the experiment, the sample was characterized by X-ray powder diffraction, Fourier transform infra-red, Brunauer–Emmet–Teller, scanning electron microscopy, transmission electron microscope and zeta potential. The effects of time, concentration, pH, temperature and number of cycles on the adsorption of 2,4-dichlorophenoxyacetic acid by UCU were observed. The results revealed that in comparison with chitosan (CS), CS@UiO-66 and UiO-66/CS, UCU showed better adsorption capacity, and the Langmuir isotherm model appropriately described the adsorption (the q_{\max} of UCU was 302.11 mg g⁻¹). After five cycles, the adsorption capacity of UCU still reached a high level (>85%). Different from no-load or internal-load UiO-66, the surface deposition can effectively enhance the crushing resistance of beads. Through the analysis on the adsorption mechanism, it was found that the strong electrostatic interaction dominated the adsorption, which was accompanied by weak π – π stacking.

Keywords: Adsorption; UiO-66; Chitosan; 2,4-D

* Corresponding author.