Environmental Engineering and Management Journal

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

ADSORPTION CHARACTERISTIC OF CARBOXYLATED CORN STALK ON LEVOFLOXACIN IN WATER

Zhenfang Hao, Jiaquan Li, Peng Tu, Hongxia Bian*

College of Science, Gansu Agricultural University, No. 1 Yingmen village, Anning District, Lanzhou, TX 730070, PR China

Abstract

This study explores the utilization of low-cost agricultural residue, corn straw, to develop an efficient adsorbent for the removal of antibiotics through a simple and environmentally friendly process. The corn straw was carboxylated via TEMPO-mediated and $NaIO_4$ oxidation techniques, characterized the structure and morphology and evaluated its ability to absorb levofloxacin (LVFX) in water. The results of FT-IR and SEM indicate that corn straw are successfully carboxylated at the C6 and C2, 3, and more micropores are exposed on the material surface by $NaIO_4$ oxidation. By investigating the effects of the adsorbent dosage, LVFX concentration, adsorption temperature, and time on the adsorption process, findings indicate that the adsorption process of carboxylated corn straw (CCS) on LVFX is well described by the Langmuir isotherm, and the maximum adsorption capacity was 3.77 mg/g for CCS-C6 and 5.3 mg/g for CCS-C2, 3. The Freundlich and Tempkin models suggest that the system is heterogeneous, involving both monolayer adsorption and interactions with functional groups, which form a heterogeneous surface multilayer conducive to LVFX adsorption. However, monolayer adsorption is the dominant mechanism for LVFX uptake. Thermodynamic analysis indicates that the adsorption process is spontaneous, exothermic, and can occur at lower or ambient temperatures. The pseudo first-order kinetics model (PFO) is more appropriate for describing the adsorption kinetics of LVFX. This research presents a novel and sustainable approach to developing green antibiotics adsorbents and may promote the practical application of LVFX removal from water.

Key words: adsorption, corn straw, carboxylation, Levofloxacin

Received: October, 2023; Revised final: August, 2025; Accepted: September, 2025

* Author to whom all correspondence should be addressed: e-mail: bhxia790311@gsau.edu.cn; Phone: +86 7631212