

Synthesis and characterization of biopolymers functionalized with APTES (3-aminopropyltriethoxysilane) for the adsorption of sunset yellow dye

Victor V. C. Lima; Fabíola B. Dalla Nora; Enrique C. Peres; Glaydson S. Reis; Éder C. Lima; Marcos L. S. Oliveira; Guilherme L. Dotto

Abstract

The biopolymers chitin (CTN) and chitosan (CTS) were functionalized with APTES (3-aminopropyltriethoxysilane) in order to enhance its adsorption potential for sunset yellow dye (SYD). The functionalization was proved by several techniques like FTIR (Fourier transform infrared spectroscopy), XRD (X-ray diffraction), N₂ adsorption/desorption isotherms, SEM (scanning electron microscopy) and EDS (energy dispersive spectroscopy). The insertion of APTES in the biopolymers has improved the adsorption properties of both, CTN and CTS. The best performance was obtained using CTS functionalized with APTES (CTS-AP), at pH of 4.0, where, more than 99% of the SYD was removed from the solution. Adsorption of SYD on CTS-AP and CTS followed the n-order kinetic model, being that, the use of CTS-AP provided a much faster rate. Freundlich model has better described the isotherms of SYD adsorption on CTS-AP and CTS. An endothermic and physical adsorption was verified. The maximum adsorption capacities were 85 and 95 mg g⁻¹ for CTS and CTS-AP, respectively. The functionalization of CTS with APTES was able to improve the adsorption capacity. However, the main roles of the functionalization was provides a faster adsorption rate, decreasing in 50% the equilibrium time, and, a great recyclability for the adsorbent.

Keywords

Chitin; Chitosan; Fast adsorption; Functionalization; Silanes