



Adsorption of humic acid from aqueous solution onto unmodified and surfactant-modified chitosan/zeolite composites

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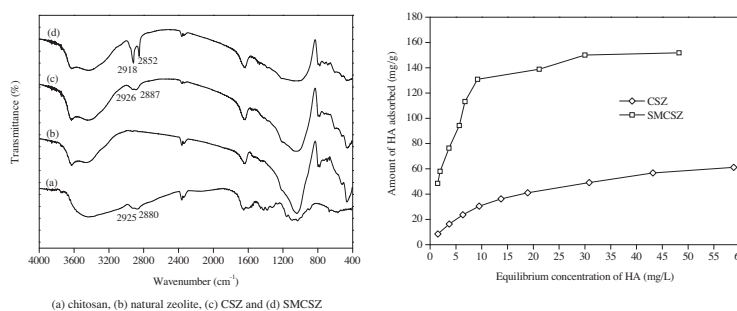
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HIGHLIGHTS

- ▶ Chitosan/zeolite composite (CSZ) and surfactant-modified CSZ (SMCSZ) were prepared.
- ▶ SMCSZ exhibited much higher affinity for humic acid (HA) than CSZ.
- ▶ The adsorption was well described by a pseudo-second-order kinetic model.
- ▶ Equilibrium adsorption data fitted well with Langmuir isotherm model.
- ▶ HA adsorbed on CSZ and SMCSZ could only be partially desorbed in NaOH solution.

GRAPHICAL ABSTRACT

Chitosan/zeolite composite (CSZ) and surfactant-modified CSZ (SMCSZ) were prepared, characterized, and used as adsorbents to remove humic acid (HA) from aqueous solution.



ARTICLE INFO

Article history:

Received 10 March 2012

Received in revised form 11 June 2012

Accepted 11 June 2012

Available online 23 June 2012

Keywords:

Chitosan
Zeolite
Composite
Surfactant
Humic acid
Adsorption

ABSTRACT

The chitosan/zeolite composite (CSZ) and surfactant-modified CSZ (SMCSZ) were prepared. The resulting composites were characterized by Fourier transform infrared (FTIR) spectroscopy, scanning electron microscope (SEM), N_2 adsorption–desorption isotherm, and thermogravimetric analysis (TGA). The adsorption of humic acid (HA) on CSZ and SMCSZ as a function of solution pH, adsorbent dosage, contact time, initial adsorbate concentration and temperature was investigated by using batch experiments. SMCSZ exhibited higher HA adsorption capacity than CSZ. The HA adsorption capacities for CSZ and SMCSZ decreased with increasing solution pH from 4 to 12. The HA removal efficiencies of CSZ and SMCSZ were found to increase with increasing adsorbent dosage. The adsorption kinetics data of HA on CSZ and SMCSZ were well described by a pseudo-second-order model. The Langmuir isotherm model fitted the equilibrium data better than the Freundlich isotherm model. The effect of temperature on HA adsorption onto CSZ could be neglected. The HA adsorption capacity for SMCSZ increased with increasing temperature. Thermodynamic parameters indicated that the adsorption of HA on SMCSZ was spontaneous and endothermic in nature. The HA molecules adsorbed on CSZ and SMCSZ could only be partially desorbed in 1 mol/L NaOH solution. The mechanisms for the adsorption of HA on CSZ at pH 7 may include electrostatic interaction and hydrophobic interaction. The mechanisms for the adsorption of HA on SMCSZ at pH 7 may include electrostatic interaction, organic partitioning and hydrogen bonding.

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