

Synthesis and Characterization of Cellulose-Based Halloysite-Carbon Adsorbent

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Abstract : Triclosan has been used as a disinfectant in many medical products, such as: hand disinfectant soaps, creams, mouthwashes, pastes and household cleaners. Due to its strong antimicrobial activity, triclosan is becoming more and more popular and the consumption of disinfectants with triclosan in it is increasing. As a result, this compound increasingly finds its way into waters and soils in an unchanged form, pollutes the environment and may have a negative effect on organisms. The aim of this study was to investigate the synthesis of cellulose-based halloysite-carbon adsorbent and perform its characterization. The template in the halloysite-carbon adsorbent was halloysite nanotubes and the carbon precursor was microcrystalline cellulose. Scanning electron microscope (SEM) images were obtained and the elementary composition (qualitative and quantitative) of the sample was determined by energy dispersion spectroscopy (EDS). The identification of the crystallographic composition of the halloysite nanotubes and the sample of the halloysite-carbon composite was carried out using the X-ray powder diffraction (XRPD) method. The FTIR spectra were acquired before and after the adsorption process in order to determine the functional groups on the adsorbent surface and confirm the interactions between adsorbent and adsorbate molecules. The parameters of the porous structure of the adsorbent, such as the specific surface area (Brunauer-Emmett-Teller method), the total pore volume and the volume of mesopores and micropores were determined. Total carbon and total organic carbon were also determined in the samples. A cellulose-based halloysite-carbon adsorbent was used to remove triclosan from water. The degree of removal of triclosan from water was approximately 90%. The results indicate that the halloysite-carbon composite can be successfully used as an effective adsorbent for removing triclosan from water.

Keywords : Adsorption, cellulose, halloysite, triclosan

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