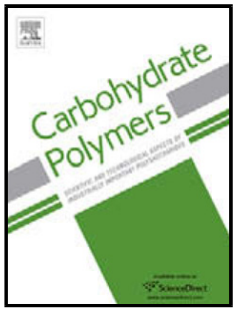

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Preparation of Polyethylene Glycol Diglycidyl Ether (PEDGE) Crosslinked Chitosan/Activated Carbon Composite Film for Cd^{2+} Removal

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Highlights

- Activated carbon and PEDGE improve mechanical properties of chitosan film
- Activated carbon is produced by pyrolysis process of oil palm empty fruit bunch.
- Adsorption capacity of the composite film is higher than chitosan film
- The composite film is low cost adsorbent with high performance.

Abstract

Preparation and characterization of polyethylene glycol diglycidyl ether (PEDGE) crosslinked chitosan/activated carbon composite film have been conducted. PEDGE was used as crosslinking agent and activated carbon as a filler on composite film preparation. The composite films were produced with several ratios of chitosan/PEDGE/activated carbon. Tensile test, Fourier Transform Infrared (FTIR), X-Ray Diffraction (XRD) and Scanning Electon Microscope (SEM) were used to study the structure and properties of PEDGE crosslinked chitosan/activated carbon composite film. Tensile test results showed crosslinking and filler influenced the tensile strength of composite films. The best composite film was obtained at 0.70/0.10/0.20 mixing ratio of chitosan/PEDGE/activated carbon. FTIR, SEM and XRD analysis confirmed the formation of PEDGE crosslinked chitosan/activated carbon composite films. The obtained PEDGE crosslinked chitosan/activated carbon composite film was used for adsorption of Cd^{2+}. The highest adsorption capacity of Cd^{2+} was obtained at pH 5 and 40 minutes contact time. Based on Langmuir adsorption isotherm model, the maximum adsorption capacity (Q) of Cd^{2+} by PEDGE crosslinked chitosan/activated carbon composite film was 357.14 mg/g. Regeneration studies showed the PEDGE crosslinked chitosan/activated carbon composite film can be used repeatly with high performance.

Keywords: Chitosan, PEDGE, activated carbon, crosslinking, filler, adsorption

1. Introduction

The increasing of heavy metal ions contamination in the environment has become the most urgent environmental problem (Jia, Wang, Wu, & Li, 2014). One of heavy metals that has a contribution of toxicity in the water is cadmium (Bunce,1994). Cadmium causes muscular cramps, chronic pulmonary problems, proteinuria, skeletal deformity, testicular atrophy, high blood pressure, kidney damage, renal disorder and human carcinogen (Sharififard, Nabavinia, & Soleimani, 2016; Barakat, 2011). Therefore, it is important to