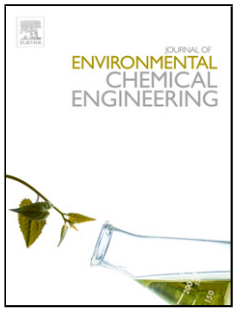

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Synthesis of Cellulose Hydrogel for Copper (II) Ions Adsorption

Teow Yeit Haan[a,b*], Kam Li Ming[b], Abdul Wahab Mohammad[a,b]
[a]Research Centre for Sustainable Process Technology (CESPRO), Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.
[b]Chemical Engineering Programme, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.

*Corresponding author. Tel: +603-89217095; E-mail: yh_teow@ukm.edu.my

Abstract

Hydrogel is a promising adsorbent for heavy metal removal. In order to conserve the environment by avoiding the hydrogel disposal problem after the adsorption process, this research work was carried out to explore the feasibility in synthesizing biodegradable cellulose hydrogel and cellulose/gelatin composite hydrogel. The effect of cross-linker volume percent and gelatin weight percent towards the adsorption capacity of hydrogels were investigated. Cellulose hydrogel with the lowest cross-linker volume percent, H6 (6 v/v%) has the greatest swelling ability (4650%), highest biodegradability rate (79.5%), and highest adsorption capacity (28.4 mg/g) compared to other cellulose hydrogels. Less compact structure of H6 has the potential to facilitate the movement of Cu^{2+} ions into the hydrogel network, increased the accessibility of the Cu^{2+} ions onto the active sites of the hydrogel, and thus enhanced its characteristics and adsorption performance. The addition of gelatin into cellulose hydrogel network has further improved the swelling ability and adsorption capacity of cellulose/gelatin composite hydrogel attributed to the presence of amine group from gelatin which has stronger affinity towards water absorption and presented stronger binding propensity towards Cu^{2+} ions. The experiment data was fitted better to the Freundlich model, indicating the occurrence of multilayer adsorption. This success of this research study has confirmed the potential application of cellulose hydrogel and cellulose/gelatin composite hydrogel as a more sustainable and environmental-friendly adsorbent for the removal of heavy metal from wastewater.

Keywords: Cellulose hydrogel, Cellulose/gelatin composite hydrogel, Biodegradable, Wastewater treatment, Adsorption