De La Salle University

SYNTHESIS AND CHARACTERIZATION OF CHITOSAN CITRATE (CC), 2-SULFOBENZOYL CHITOSAN (SBC), AND 2-SULFOBENZOYL CHITOSAN CITRATE (SBC-CC) FOR Cu^{2+} ADSORPTION: EQUILIBRIUM AND KINETIC STUDIES

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ABSTRACT

The study aimed to synthesize and characterize modified chitosan adsorbent and to use it to perform equilibrium and kinetic studies on the adsorption of copper (II) ions from aqueous solution. The three (3) modification procedures of chitosan are: (1) *N*-derivatization reaction of 2-sulfobenzoic acid cyclic anhydride with the amino group of chitosan; (2) *O*-crosslinking of chitosan with citric acid; and (3) two step modification: (a) the reaction of 2-sulfobenzoic acid cyclic anhydride with the amino group of chitosan; (b) *O*-cross-linking of the *N*-derivatized chitosan with citric acid. The changes in the molecular structures of chitosan after grafting and cross-linking reactions were confirmed by FTIR (KBr disk method), DSC, SEM, and powder X-ray diffraction experiments. The solubility of chitosan was significantly reduced after the modification procedures. Results showed that the adsorption of Cu (II) ions using chitosan, CC, SBC, and SBC-CC were dependent on pH of the solution. The percent Cu (II) ions removed from the aqueous solution decreases as the initial copper metal ion concentration increases. The best interpretation of the equilibrium data for chitosan is Dubinin-Radushkevich isotherm, Freundlich for SBC, Langmuir isotherm for CC and Temkin for SBC-CC. The adsorption kinetics followed the mechanism of pseudo-second order equation. The results showed that grafted chitosan (2-SBACA) followed by cross-linking (citric acid), SBC-CC presented higher adsorption capacity for Cu (II) (110.89 mg/g) compared with CC (89.59 mg/g), chitosan (82.66 mg/g) and SBC (79.28 mg/g).