

Title : Sodium Alginate Hydrogel Bio-adsorbent for Methylene Blue Dye Removal

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Cooperative Education (กรณี นำเสนอผลงานสหกิจศึกษา)

ABSTRACT

This research, bio-adsorbent of sodium alginate (SA) hydrogels cross-linked with glutaraldehyde was prepared and the efficiency of methylene blue dye removal of the hydrogel was investigated. The prepared hydrogels were characterized using compression test and Thermogravimetric analysis. Furthermore, the dye removal capacity of the SA hydrogel was examined under the effects of TiO_2 content, pH and adsorption time. Characterization results revealed that the glutaraldehyde cross-linked hydrogels exhibited better mechanical strength and excellent thermal stability. From dye adsorption experiments, it was found that TiO_2 content was not significantly affect the dye removal efficiency. For the effect of pH, it demonstrated that an acidic environment at pH 3.0 was the optimal condition for adsorption, yielding the highest dye removal efficiency. The effect of adsorption time revealed that the adsorption rate rapidly increased for 40 minutes and reached the equilibrium within 60 minutes. In addition, the adsorption kinetic and isotherm models were studied. The results showed that the adsorption process of the SA hydrogel followed the pseudo-second-order kinetics and the Freundlich isotherm model, suggesting chemisorption on a heterogeneous surface with multilayer formation. Moreover, the SA hydrogel also demonstrated effective reusability, maintaining high adsorption capacity even after five consecutive cycles.

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