

Alginate-based hydrogel for water treatment

Soliman Mehawed Abdellatif Soliman*, Aya Mohamed Ali, Magdy Wadid Sabaa

Chemistry Department, Faculty of Science, Cairo University, 12613 Giza, Egypt, Tel. +2011-47793600,
email: sabdellatif@sci.cu.edu.eg (S.M.A. Soliman), Tel. +20128-5655803, email: Aya_helwan2008@yahoo.com (A.M. Ali),
Tel. +20100-5407917, email: mwsabaa@sci.cu.edu.eg (M.W. Sabaa)

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ABSTRACT

Hydrogels based on sodium alginate and poly(4-vinylpyridine) were successfully prepared via physical cross-linking by ionic interaction. Different hydrogels with different percentages of gelation were prepared by varying the molar ratio between sodium alginate and poly(4-vinylpyridine). The prepared hydrogels were characterized using different techniques as FT-IR spectroscopy, X-ray diffraction (XRD), thermal gravimetric analyses (TGA) and scanning electron microscope (SEM). Increasing of initial decomposition temperature of alginate due to interaction with poly(4-vinylpyridine) was observed. Industrial wastewater mainly contains toxic heavy metal ions and/or dyes (acidic and cationic). In the current study, the removal of heavy metal ions and dyes are studied. Moreover, the behaviors of prepared hydrogels in different buffer solutions were determined. The results show that degree of swelling (DS) is increasing with the increase in the content of poly(4-vinylpyridine) in the hydrogels. This increasing in DS is much more pronounced in acidic pH than neutral and alkaline pH. The presence of poly(4-vinylpyridine) in the hydrogels increases the metal ions adsorption as compared with calcium alginate based hydrogel in the ordering $Cr^{6+} > Cu^{2+} > Ni^{2+} > Cd^{2+}$. Hydrogels based on poly(4-vinylpyridine) improves acidic dye uptake as compared to hydrogel based on calcium alginate.

Keywords: Poly(4-vinylpyridine); Thermal stability; Swelling degree; Dye uptake; Heavy metal ions

*Corresponding author.