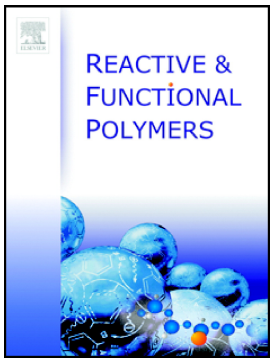

Effect of ionic and covalent crosslinking agents on properties of chitosan beads and sorption effectiveness of Reactive Black 5 dye

Tomasz Jóźwiak, Urszula Filipkowska, Paula Szymczyk, Joanna Rodziewicz, Artur Mielcarek

PII: S1381-5148(17)30048-2
DOI: doi: 10.1016/j.reactfunctpolym.2017.03.007
Reference: REACT 3818

To appear in: *Reactive and Functional Polymers*

Received date: 21 November 2016
Revised date: 13 March 2017
Accepted date: 14 March 2017

Please cite this article as: Tomasz Jóźwiak, Urszula Filipkowska, Paula Szymczyk, Joanna Rodziewicz, Artur Mielcarek , Effect of ionic and covalent crosslinking agents on properties of chitosan beads and sorption effectiveness of Reactive Black 5 dye. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. React(2017), doi: 10.1016/j.reactfunctpolym.2017.03.007

Effect of ionic and covalent crosslinking agents on properties of chitosan beads and sorption effectiveness of Reactive Black 5 dye

Tomasz Jóźwiak [1a]*, Urszula Filipkowska [1b], Paula Szymczyk [1c], Joanna Rodziewicz [1d], Artur Mielcarek [1e]

[1] Department of Environmental Engineering, University of Warmia and Mazury in Olsztyn, ul. Warszawska 117a, 10-957 Olsztyn, Poland

[a] tomasz.jozwiak@uwm.edu.pl

[b] urszula.filipkowska@uwm.edu.pl

[c] paula.szymczyk@uwm.edu.pl

[d] joanna.rodziewicz@uwm.edu.pl

[e] artur.mielcarek@uwm.edu.pl

* Corresponding author: Tomasz Jóźwiak, Department of Environmental Engineering, University of Warmia and Mazury in Olsztyn, ul. Warszawska 117a, 10-957 Olsztyn, Poland, e-mail: tomasz.jozwiak@uwm.edu.pl

Abstract

This study compared properties of hydrogel chitosan sorbents crosslinked with eight agents, including four ionic ones: sodium citrate, sodium tripolyphosphate, sulfosuccinic acid, and oxalic acid and four covalent ones: glutaraldehyde, epichlorohydrin, trymethylpropane triglycidyl ether, and ethylene glycol diglycidyl ether. The effect of crosslinking process conditions (pH, temperature) and dose of the crosslinking agent on chitosan sorbent stability during sorption and on the effectiveness of Reactive Black 5 dye sorption were examined. The optimal parameters of crosslinking ensuring sorbent stability in acidic solutions and high sorption capability were established for each crosslinking agent tested. The susceptibility of crosslinked sorbents to mechanical damages was analyzed as well.

The process of ionic crosslinking was the most effective at the pH value below which hydrogel chitosan sorbent began to dissolve (pH 4). The crosslinking temperature ranging from 25 to 60 ^{o}C had no effect upon sorbent stability. The higher temperature during ionic crosslinking, however, slightly decreased RB5 sorption effectiveness. The ionic crosslinking significantly decrease the susceptibility of chitosan hydrogels to mechanical damages. In the case of covalent crosslinking of chitosan hydrogel beads, the effect of process conditions (pH, temperature) on the properties of the crosslinked sorbent depended on the type of crosslinking agent. The sorbents crosslinked with covalent agents were usually harder but also more fragile, and therefore more susceptible to mechanical damages.

Key words:

Chitosan; crosslinking; covalent crosslinking agents; ionic crosslinking agents; Reactive Black 5