

## Cross-linked sodium alginate-carboxymethyl chitosan hydrogel beads for adsorption of Ni(II) ions

Qingping Song, Bangjie Ouyang, Ying Lin, Chongxia Wang\*

School of Chemical and Environmental Engineering, Anhui Polytechnic University, Anhui, China, emails: wangcx@ahpu.edu.cn (C. Wang), songqp@ahpu.edu.cn (Q. Song), 210619475@qq.com (B. Ouyang), ly2005501@163.com (Y. Lin)

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### ABSTRACT

A cross-linked sodium alginate-carboxymethyl chitosan hydrogel beads (CHB) was synthesized using calcium chloride and epichlorohydrin as cross-linkers. The synthesized CHB adsorbent was characterized by Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy and energy-dispersive X-ray spectroscopy. The Ni(II) removal by the CHB was investigated, several parameters influencing the adsorption of Ni(II) ions such as contact time, pH, initial Ni(II) concentration and regeneration performance were investigated. Results revealed that the adsorption equilibrium was reached within 6 h and the maximum capacity of CHB for Ni(II) was obtained to be 128.4 mg/g. The equilibrium adsorption data fitted well to the Freundlich model and the adsorption kinetic data followed the pseudo-second-order model. Furthermore, the prepared CHB showed good adsorption performance after five cycles of regeneration. Finally, FTIR and X-ray photoelectron spectroscopy analysis showed that the hydroxyl, amino and carboxyl groups were involved in the adsorption of Ni(II).

*Keywords:* Adsorption; Carboxymethyl chitosan; Cross-linking; Hydrogel; Sodium alginate

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\* Corresponding author.