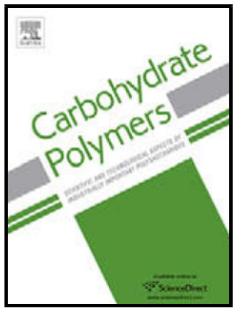

Title: Ion exchange kinetics of magnetic alginate ferrogel beads produced by external gelation

Author: Vânea Ferreira Torres Teixeira Nádia Rosa Pereira Walter Ruggeri Waldman Ana Luiza Cassiano Dias Ávila Victor Haber Pérez Rubén Jesus Sánchez Rodríguez

PII: S0144-8617(14)00366-X
DOI: http://dx.doi.org/doi:10.1016/j.carbpol.2014.04.009
Reference: CARP 8770

To appear in:

Received date: 27-8-2013
Revised date: 11-3-2014
Accepted date: 7-4-2014

Please cite this article as: Teixeira, V. F. T., Pereira, N. R., Waldman, W. R., Ávila, A. L. C. D., Pérez, V. H., & Rodríguez, R. J. S.,Ion exchange kinetics of magnetic alginate ferrogel beads produced by external gelation, *Carbohydrate Polymers* (2014), http://dx.doi.org/10.1016/j.carbpol.2014.04.009

Ion exchange kinetics of magnetic alginate ferrogel beads produced by external gelation

Vânea Ferreira Torres Teixeira[1], Nádia Rosa Pereira[1*], Walter Ruggeri Waldman[2], Ana Luiza Cassiano Dias Ávila[1], Victor Haber Pérez[1] and Rubén Jesus Sánchez Rodríguez[3]

[1]Laboratory of Food Technology, Agricultural Science and Technology Center, Northern Rio de Janeiro State University (UENF), Campos dos Goytacazes, Rio de Janeiro, Brazil.

[2] Department of physics, chemistry and mathematics, Federal University of São Carlos (UFSCar), Sorocaba, São Paulo, Brazil

[3]Laboratory of Advanced Materials, Science and Technology Center, Northern Rio de Janeiro State University (UENF), Campos dos Goytacazes, Rio de Janeiro, Brazil.

*corresponding author, ph: +55 22 27486515, fax: +55 22 27397194, nadiar@uenf.br

Abstract

This paper reports on a study of the influence of sodium alginate concentration and iron addition on the ion exchange kinetics of calcium alginate ferrogel beads produced by external gelation. The calcium absorption and sodium release of the beads were fitted to Fick´s second law for unsteady state diffusion in order to obtain the effective diffusion coefficients of Na^+ and Ca^{2+}. The dried beads were characterized concerning their thermal stability, particle size distribution and morphology. The gelation kinetics showed that an increase in alginate concentration from 1% to 2% increased the Ca^{2+} equilibrium concentration, but presented no effect on Ca^{2+} effective diffusion coefficient. Alginate concentration higher than 2% promoted saturation of binding sites at the bead surfaces. The addition of iron promoted faster diffusion of Ca^{2+} inside the gel beads and reduced the Ca^{2+} equilibrium concentration. Also, iron particles entrapped in the alginate gel beads promoted greater absorption of water compared to pure alginate gel and lower thermal stability of the beads. The main diffusion of Ca^{2+} into and Na^+ out from the bead took place during the first 60