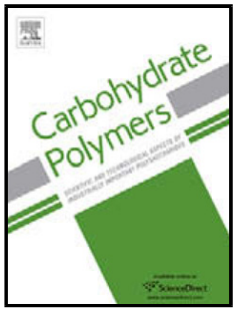

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Author: Marion Bruchet Artem Melman

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Fabrication of patterned calcium cross-linked alginate hydrogel films and coatings through reductive cation exchange

*Marion Bruchet and Artem Melman**

Department of Chemistry and Biomolecular Science, Clarkson University

8 Clarkson Ave. , Potsdam New York 13699-5810, USA

Phone +1 (315) 268-4405

Email: bruchem@clarkson.edu (Marion Bruchet)

amelman@clarkson.edu (Artem Melman)

Abstract: Calcium cross-linked alginate hydrogels are widely used in targeted drug delivery, tissue engineering, wound treatment, and other biomedical applications. We developed a method for preparing homogeneous alginate hydrogels cross-linked with Ca^{2+} cations using reductive cation exchange in homogeneous iron(III) cross-linked alginate hydrogels. Treatment of iron(III) cross-linked alginate hydrogels with calcium salts and sodium ascorbate results in reduction of iron(III) cations to iron(II) that are instantaneously replaced with Ca^{2+} cations, producing homogeneous ionically cross-linking hydrogels. Alternatively, the cation exchange can be performed by photochemical reduction in the presence of calcium chloride using a sacrificial photoreductant. This approach allows fabrication of patterned calcium alginate hydrogels through photochemical patterning of iron(III) cross-linked alginate hydrogel followed by the photochemical reductive exchange of iron cations to calcium.