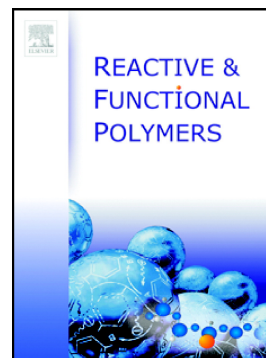


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Aspartic acid grafting on cellulose and chitosan for enhanced Nd(III) sorption**Ahmed A. Galhoum,^{a,b} Khalid M. Hassan,^c Osman A. Desouky,^a Ahmed M. Masoud,^a****Takaya Akashi,^d Yuka Sakai,^d Eric Guibal^{b*}**^aNuclear Materials Authority, P.O. Box 530, El-Maadi, Cairo, Egypt.^bEcole des Mines Alès, Centre des Matériaux des Mines d'Alès, 6 avenue de Clavières, Alès cedex, France.^cPhysics and Mathematics Engineering Department, Faculty of Electronic Engineering, Menoufia University, Egypt.^dFaculty of Bioscience and Applied Chemistry, Hosei University, Japan.

Abstract: Cellulose and chitosan have intrinsic sorption properties for Nd(III); however, their efficiency for metal recovery can be easily improved by a relatively simple chemical modification. The grafting of aspartic acid via an intermediary chlorination step of the polysaccharides allows increasing sorption capacities due to the specific reactivity of carboxylate groups. The grafting process is confirmed by elemental analysis, FTIR spectrometry, while the physical properties of the derivatives are characterized by XRD (crystallinity) and TGA (thermogravimetric analysis). The sorption properties are carried out by investigating the effect of the pH, studying the uptake kinetics and the evaluating the thermodynamics (sorption isotherms). The sorption properties of modified sorbents are systematically compared to the performance of raw materials. Sorption capacity is doubled after grafting aspartic acid onto biopolymer backbone. Sorption isotherms are described by the Freundlich and the Langmuir equation and maximum sorption capacities reach up to 77-80 mg Nd g⁻¹ at pH 5. The uptake kinetics are described by the pseudo-first order reaction rate and under selected experimental conditions the equilibrium is reached within 3 hours of contact. The sorption is spontaneous, endothermic. Metal desorption can be successfully performed with 0.5 M nitric acid and the sorbents can be recycled for at least 4 sorption/desorption cycles without significant loss in sorption/desorption performances.

Keywords: neodymium; sorption isotherms; uptake kinetics; metal desorption; thermodynamics; aspartic acid grafting; chemical modification of biopolymers.

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