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Influence of the degree of deacetylation of chitosan on the surface properties of layer-by-layer films

José Diego Magalhães Soares¹, Edgar Siebeneichler Branco¹, Dybson Manoel da Silva Nascimento¹, Eduarda Baggio Paglia², Anderson Fiamingo³, João Inácio Soletti¹, Sérgio Paulo Campana Filho⁴, Marisa Masumi Beppu⁵, João Batista Maia Rocha Neto¹

¹Universidade Federal de Alagoas, ²Universidade Estadual de Campinas (*Faculdade de Engenharia Química*) , ³Centro Estadual de Educação Tecnológica Paula souza, ⁴Sao Carlos Institute of Chemistry University of Sao Paulo (*Físico Química*) , ⁵University of Campinas (*Faculdade de Engenharia Química*)

e-mail: jose.magalhaes@ctec.ufal.br

Here, we assessed the influence of the chitosan degree of deacetylation (DD) on the surface properties of alginate(ALG)/chitosan(CHI) films developed via the Layer-by-layer (LbL) technique. The CHI solutions were prepared under different DD conditions (40, 75 and 95%). LbL films were produced by alternating immersions of glass substrates in ALG and CHI solutions at pH 3.0 for 15 min each, followed by three rinsing steps with ultrapure water (2 min, 1 min, and 1 min, respectively) between each polyelectrolyte immersion. The ALG/CHI films were characterized by Water Contact Angle and Atomic Force Microscopy (AFM) to evaluate the effect of the chitosan DD on the hydrophilicity and roughness of the coatings, respectively. Water contact angle and AFM results indicated that the increase of the chitosan degree of deacetylation led to less hydrophilic and rougher ALG/CHI films. The wettability properties of the films are a direct consequence of the presence of functional groups in the CHI chain since CHI samples tend to be more hydrophobic with a lower amount of amino groups in their structures [1]. Since the film assembly occurs in the isolated islets growth regime, a higher DD condition requires a smaller amount of CHI for charge compensation, which hampers the assembly of a large number of isolated islets, increasing film roughness as reported in the literature [2]. In summary, we suggest DD as a key factor in controlling the properties of chitosan-based materials for a wide range of biotechnological applications.

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References:

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