Characterization of polyelectrolyte polysaccharides as a function of concentration, pH and ionic strength

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Polyelectrolyte multilayer coatings have become a new and general way to functionalize and modify surfaces of various materials to change their interfacial properties, lead the sequential adsorption of polyelectrolytes of opposite charges to the formation of multilayer nanostructures. Sodium alginate, carragennan, chitosan, and two galactomannans were characterized in terms of their zeta potential (Zp) and hydrodynamic diameter (Z-average) (measured by dynamic light scattering), based on a 2^3 full factorial design, were the polysaccharides concentrations ranged from 0.2 % to 0.6 %, pH ranged from 3 to 7 and salt (NaCl) concentration ranged from 0 to 0.1 %, being the most influent parameters determined by Pareto charts.

In the sodium alginate solution the Zp ranged from -50.5 to -84.7 mV and the Z-average varied between 765 and 3330 nm; in the carragennan solution the Zp ranged from -24.1 to -83.5 mV and the Z-average varied between 432 and 1400 nm; in both cases, the concentrations of polysaccharide and NaCl were the most influent parameters. For the chitosan solution, the values of the Zp ranged from 64.5 to 31.2 mV and the Z-average varied from 236 to 5500 nm; the main influencing parameters were the concentration of chitosan and the pH. For the galactomannan solutions the Zp ranged from -13.1 to -1.94 mV and from -14.3 to -2.70 mV, and the Z-average varied from 3230 to 41400 nm and from 2010 to 8540 nm for G. triacanthos and C. pulcherrima, respectively; the concentrations of NaCl and galactomannan showed to be the most influencing parameters.

This work provides information regarding important polyelectrolyte properties and how these properties can be controlled by changing the polysaccharide concentration, pH and salt concentration, important to control the structure and texture of manufactured products in view of their potential application in the food, pharmaceutical, and cosmetic industries.