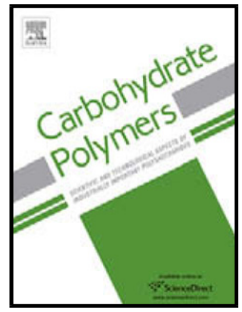

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PHYSICAL CHARACTERIZATION AND MODELING OF CHITOSAN/PEG BLENDS FOR INJECTABLE SCAFFOLDS

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Highlights:

- Injectable Scaffold composed of Chitosan/PEG physical blend revealed shear-thinning pseudo-plastic behavior after Ostwald-Waelle model application on rheological data;
- Textural characterization revealed adequate adhesiveness and cohesiveness for an injectable scaffold;
- Using rheological data and injectable model was established and validated. Simulations revealed that the most critical parameter is draw speed;

Abstract

Injectable scaffolds find many applications on the biomedical field due to several advantages on preformed scaffolds such as being able to fill any defect can be used in minimal invasion surgeries and are ready to use products. The most critical parameter for an injectable scaffold usage is its injectability, which can be related with rheological properties. Therefore, the objective of the present work was to increase knowledge about the critical parameters influencing injectability of biopolymers used for injectable scaffolds. Rheological and mechanical properties of a biopolymer blend in combination with injectability tests for a given design space controlled by the concentrations of both polymers and temperatures was made. Then those results were modeled to better understand the impact of parameters on injectability. The biopolymer blend chosen was Chitosan physically blended with Poly(ethylene glycol) where variations of both polymer concentrations and molecular weights were tested. Rheological and mechanical properties of all samples were determined, together with the injection force using a compression test at different injection conditions. All solutions were clear and transparent suggesting perfect miscibility. Rheological results were modeled using Ostwald-Waelle law and revealed a shear thinning pseudo-plastic solution at any composition and temperature, being chitosan concentration the most influencing variable. Compression tests results revealed mean injection forces ranging from 9.9 ± 0.06N to 29.9 ± 0.65N and it was possible to accurately estimate those results. Simulations revealed draw speed as the most influencing parameter. Cell viability tests revealed a non-cytotoxic biopolymer blend.

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Keywords: Rheology, Texture, Injectability, Biopolymer Blends, Modeling