

Optimization of microfluidization for the homogeneous distribution of cellulose nanocrystals (CNCs) in biopolymeric matrix

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Abstract Microfluidization, which is a high-pressure homogenization technique, was used to develop highly dispersed cellulose nanocrystal (CNC) reinforced chitosan based nanocomposite films. A three factor central composite design with five levels was designed to systematically optimize the microfluidization process. The three factors were the CNC content, the microfluidization pressure and the number of microfluidization cycles. Response surface methodology was used to obtain relationship between the mechanical properties of the nanocomposite films and the factors. Polynomial

Microscopic analysis of the microfluidized nanocomposite films revealed a 10–15 times reduction in the size of the aggregates compared to the non-microfluidized CNC/chitosan films and an increase in the root mean square surface roughness (Rq).

Keywords Chitosan · Cellulose nanocrystal · Bionanocomposite · Experimental design · High-pressure-homogenization · Mechanical property · Nanomaterial dispersion · Polyelectrolyte complex