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ORIGINAL ARTICLE

Thermal, Mechanical and Microstructures Properties of Cellulose Derivatives Films: A Comparative Study

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Abstract The proposal in this study was to evaluate the physical properties of different biopolymers films. The materials used were: pectin, carboxyl methylcellulose, methylcellulose, hydroxyl propylcellulose, hydroxypropyl-methylcellulose, and corn waxy starch; from these polysaccharides aqueous dispersions were prepared to 3% (*w*/*v*) for obtained films. In these biopolymer films, the thermal diffusivities (α) was evaluated by the Open Photoacoustic Cell method; also, their mechanical properties as tensile strength, elongation, and Young's modulus were measured, their crystallinity percentage was evaluated by X-ray diffraction and microstructure through atomic force microscopy in contact mode. From the polysaccharide films, it was observed that most of them were flexible and transparent. In the case of the films, mechanical properties were found that the highest value of tensile strength and Young's modulus corresponded to carboxyl methylcellulose with 69.17 and 1,912.20 MPa values, respectively. Also, Open Photoacoustic Cell method and X-ray diffraction measurements showed that there exist a correlation between the thermal diffusivity values and the crystallinity measured in the biopolymer films. It was also observed that α values of cellulose derived was affected by the substitution group in the molecule, reaching the highest α value, the films of carboxyl methylcellulose. Regarding the microstructural of the films, starch showed the highest roughness value (88.6 nm) whereas hydroxypropyl-methylcellulose resulted with the lowest roughness value (7.67 nm).

Keywords Photoacoustic · Carboxyl methylcellulose · Hydroxyl propylcellulose · Hydroxypropyl methylcellulose · Pectin · Starch

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Introduction

A considerable interest exists to use natural polymers, generally used in the daily diet, for preparing active principles of specific action in the colon, since they are safer materials and also more available than the synthetic ones,[1] they also possess cost-effectiveness and broad regulatory acceptance. Delivery of sensitive bioactive ingredients to the colon is a common practice in the pharmaceutical industry and is drawing growing attention in the food ingredients industries.[2] An enteric cover should protect from the effect of severe conditions in the gastrointestinal tract, including the acid nature of the