Suspensions of Nanocrystalline Cellulose (NCC) at a critical concentration, have the ability to self-assemble into a chiral nematic phase which is retained upon evaporation of the solvent. As a result of the evaporation process, multilayered solid films with a helical structure are formed. This structure mimics that of the cuticle of certain beetle species and is responsible of the iridescence and optical properties of the films. These solidified NCC films have attracted increasing attention in the materials research field due to its unique properties, among them as selective chiral reflectors which show a selective reflection of left handed circularly polarized light and also, a high transmission of right handed circularly polarized light. However there is a lack of control in the uniformity of the films arising from different defects in the helical structure. In this work we evaluate the effect of the processing conditions, from the isolation and purification of the crystalline regions present in cellulose fibers, which are governed by the source and heat treatment during hydrolysis, to the drying kinetics which allows the formation and stabilization of the chiral nematic structure on the uniformity and selective reflection of the films. The resulting films were characterized optically acquiring the reflection spectra of unpolarized light, optical microscopy imaging, and UV-Vis Spectroscopy with polarized and unpolarized light in the visible spectral regime in order to confirm the selective reflection of the films. The structural characterization was performed by X-Ray Diffraction, Fourier Transform Infrared Spectroscopy and Scanning Electron Microscopy imaging. The results show that the drying kinetics highly influences the formation of reflection bands at the visible spectrum.

Keywords: Nanocrystalline cellulose, Chiral nematic phase, Selective chiral nematic reflectors

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