Spin coated cellulose/xyloglucan multilayered films

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Cellulose is one of the most abundant polymers on earth available from renewable resources. In nature, cellulose microfibrils are cross-linked by a polysaccharide called xyloglucan (XG). They form a strong and flexible network, mainly due to hydrogen bonds and van der Waals interactions [1,2]. In the other hand, nanostructured materials are of great interest as they open up applications in different fields: composite materials, optics… As a result of decrease of the oil resources, polymers from biomass retain an increasing interest and have been developed as nanostructured systems [3].

With the aim of building materials only made of renewable resources, this work focuses on films composed of alternate depositions of cellulose nanocrystals (CN) and XG built by spin coating. The films internal structure and their growth were studied by a joint analysis of neutron reflectivity and atomic force microscopy according to the concentration regimes of xyloglucan solution. The experiments results showed that linear growth is allowed when XG solution is in the semi-dilute regime while no growth is observed in concentrated regime. Besides, internal structure and surface morphology are quite different according to concentration regime used for the building of film.

Figure 1: Neutron reflectivity curves in RQ representation of XG/CN multilayered films obtained by spincoating from solutions of XG at different concentrations (0.5 g/L ; 1g/L ; 5 g/l ; 10 g/L).