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Slot-die coated cellulose colloid layer

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Slot-die coated cellulose nanofibrils CNF layers are compact, homogenous, and have a low roughness. These properties give them specific imbibition properties for different colloids. We studied the coating of the novel slot-die coated CNF layer in real-time using grazing incidence small-angle X-ray scattering. We compare the imbibition properties of water and colloidal inks of slot die-coated CNF layer with well-known spray-coated CNF layer. To study the imbibition properties, we apply poly-butylmethacrylate (PBMA) and polysobrerol-methacrylate based inks in an aqueous solution. The depositions are observed via GISAXS. In addition, the imbibition properties of the CNF systems during annealing are quantified. Our results show that the structure and morphology of the hybrid CNF-colloid layers will change when the glass transition temperature of the colloids is exceeded.

Spectroscopic ellipsometry shows that the small colloids can be imbibed into the cellulose nanofibrils (CNF) layer and change the refractive index for the pure CNF layer. A gradient in the refractive index correlates to the imbibition depth of the colloids into the CNF layer of the small colloidal system. The colloids only form a top layer on CNF without a gradient layer. After the evaporation of the water, the voids are filled with colloids. During the annealing, we observed shape changes of the colloids. These results can be used for a better and more stable coating of nanoparticles on porous materials.

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