Abstract Submitted
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Amorphous Cellulose Thin Films HOWARD WANG, RUI LU, XIN ZHANG, ROBERT BRIBER, Univ of Maryland-College Park, LI FU, HONGFEI WANG, Pacific Northwest National Laboratory, GUANGCUI YUAN, NIST Center for Neutron Research — Amorphous cellulose thin films with sub-nanometer roughness and 8 - 100 nm thicknesses have been fabricated by spin casting from molecular solutions of cellulose in mixtures of ionic liquid 1-ethyl-3-methylimidazolium acetate (EMIMAc) and organic solvent dimethyl sulfoxide (DMSO). Combining advanced x-ray, optical and scanning probe measurements, cellulose films are found be pure cellulose, free of residual EMIMAc and DMSO, as well as truly amorphous, free of crystallites. The mass density of films with thickness greater than 30 nm is ca. 1.497 g.cm^{-3}, approaching that of the bulk amorphous cellulose. The fraction of voids is ca. 1.7 % in ultrathin 8 nm film, and decreases to 0.25 % in thicker films. The equilibrium state of the amorphous cellulose films is achieved through successive diffusion of ionic liquid molecules out of cellulose films with simultaneous formation of hydrogen bonding among cellulose chains.

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