

Title: Cellulose dissolution: Comparison of two non-derivatizing solvent systems and the effect of additives

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Abstract:

Cellulose is an abundant renewable material, which processing and applicability is limited owing to cellulose inability to dissolve in commonly used solvents. Only specific solvents or their combinations are able to dissolve cellulose and its dissolution processes remain unclear till nowadays. Aim of this thesis was to acquire new experimental information on the changes which cellulose exhibits upon dissolution in two exemplary solvents: an ionic liquid 1-butyl-3-methylimidazolium chloride (bmimCl) and in an organic solvent *N,N*-dimethylacetamide (DMAc) with lithium chloride (LiCl). The main tool for that investigation is vibrational spectroscopy which provides valuable information about the polymer structure. Similarities and differences found in the spectra of cellulose in those two solvents and influence of cellulose on the solvents are analyzed. Furthermore, influence of additives on the cellulose-solvent interactions is also investigated. It is found that water at low concentration (<3 wt%) acts as a co-solvent in cellulose-bmimCl mixtures. Presence of the other additives, triblock copolymers “Pluronics”, is shown to affect only cellulose in DMAc with LiCl at temperatures above 26 °C. The acquired information leads to better understanding of cellulose dissolution processes and may lead to further advancements in cellulose processing and in preparation of new cellulose-based materials.

Keywords: cellulose dissolution, vibrational spectroscopy, ionic liquid, *N,N*-dimethylacetamide with LiCl