



Mardi 28 novembre 2017 à 10h30

Salle Jean Barriol, FST-Bât 2^{ème} cycle, entrée 2A, 7^{ème} étage

Advances in cellulose dissolution and regeneration: from scattering and rheology to a new NMR approach

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As the major carbohydrate produced by plant biosynthesis, cellulose occupies a prominent place as a “green” polymer for the production of innovative and sustainable materials. Unlike other polymers, cellulose is not meltable and therefore most of its applications rely on an efficient dissolution step followed by shaping processes where the properties of the regenerated material are strongly dependent on how well cellulose is dissolved and organized in solution.

Cellulose is insoluble in water but can be dissolved in acidic or alkaline conditions, given the proper conditions. However, work in developing new solvents for cellulose has been following a “trial and error” empirical character. It is clear that a better understanding of the dissolution of cellulose has deep implications, not least for industrial developments. In the first part of this talk some basic fundamentals will be reviewed together with current perspectives. We will see that hydrogen bonding mechanism alone cannot explain the low aqueous solubility. Our recent work rather emphasizes the role of cellulose charge and the concomitant ion entropy effects, as well as hydrophobic interactions.

On the second part, a new NMR methodology - Polarization Transfer Solid State NMR (PT ssNMR) is introduced as a promising technique regarding an efficient and robust characterization of the solution state of cellulose. With this method it is possible to identify the liquid and solid fractions of cellulose, the degradation products, cellulose polymorphs, etc. Finally, combining static light and small angle X-ray scattering we will also probe the effect of cellulose aggregation on solution rheology.