Russell Berrie Nanotechnology Institute
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"Amphiphilic properties of cellulose: Dissolution, association and network formation"

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12:00 refreshments
12:30 lecture

Wang Auditorium
The Dalia Maydan Building
Faculty of Materials Science and Engineering

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Amphiphilic properties of cellulose: Dissolution, association and network formation.

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Cellulose is difficult to dissolve and the use of cellulose in formulations, including the formation of colloidal particles and fibers is limited by solubility limitations. Cellulose is known to be insoluble in water and in many organic solvents, but can be dissolved in a number of solvents of intermediate properties, like N-methylmorpholine N-oxide (NMMO) and ionic liquids (ILs) which, apparently, are not clearly related. It can also be dissolved in water at extreme pHs, in particular if a cosolute of intermediate polarity is added. The insolubility in water is often referred to strong intermolecular hydrogen bonding between cellulose molecules. Revisiting some fundamental polymer physicochemical aspects (i.e. intermolecular interactions) a different picture is now revealed: cellulose is significantly amphiphilic and hydrophobic interactions are important to understand its solubility pattern. In this work we try to expose the root of developing novel solvents for cellulose based on a critical analysis of the intermolecular interactions involved and mechanisms of dissolution. The hypothesis of cellulose insolubility induced by hydrophobic interactions has created significant interest. We also illustrate the association and precipitation of cellulose from rheology studies and how it can be affected by other amphiphilic compounds. Cellulose has a strong tendency to re-assemble when dissolved; this process is strongly affected by surfactants and other additives affecting hydrophobic interactions.

Literature

On the mechanism of dissolution of cellulose
B. Lindman ,G. Karlström, L. Stigsson
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W. G. Glasser, R. H. Atalla, J. Blackwell, R. M. Brown Jr., W. Burchard, A. D. French; D. O. Klemm, P. Navard, Y. Nishiyama
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