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Cellulose dissolution: Promising approach for the preparation of composite materials

Noureddine Abidi, Sanjit Acharya, Poorna Wansapura, Niwanthi Dissanayake, Yang Hu and **Rohan Dassanayake**
Texas Tech University, USA

Cellulose is the most abundant natural polymer on earth. Cotton fiber is composed of 95% of cellulose. The dissolution of cellulose represents the first key step for most applications of cellulose and it is highly affected by its degree of polymerization (DP). Due to the high DP (9000-15000), the dissolution of cellulose is difficult to achieve under relatively mild conditions. Cellulose is a very stable polymer as it plays a crucial role in the structural soundness of plants. This stability makes it particularly difficult to deconstruct. The degree of insolubility is due to its chemical and physical structure. In order for dissolution to occur, a solvent must be able to penetrate between microfibrils and cellulose chains. The extent of the use of cellulose to develop an economically sustainable renewable bioproducts industry is limited due to its inefficient and incomplete dissolution in most common solvents. In this paper, we report on the dissolution of cellulose in three solvent systems: NaOH/urea, DMAC/LiCl and 3-butyl 1-immidazolum chloride ionic liquid (BmimCl)). Microcrystalline cellulose and cotton fibers were used as source of cellulose. Cellulose was dissolved in NaOH/urea, DMAC/LiCl and ionic liquid (3-butyl 1-immidazolum chloride) followed by regeneration in water. Films and aerogel materials were formed from the cellulose gel. Electron scanning microscopy, Fourier transform infrared spectroscopy, BET, wide angle X-ray diffraction, were used to characterize the morphology, functional groups, surface porous morphology and crystallinity.

Biography

Noureddine Abidi is Associate Professor and Associate Director of the Fiber and Biopolymer Research Institute at Texas Tech University. He holds a *"Habilitation à Diriger des Recherches"* from the University of Haute Alsace in France and a PhD from the University of Montpellier II in France. He has generated more than 58 refereed journal publications, 1 book, 10 book chapters, more than 123 conference papers, 1 patent, 1 provisional patent, and 6 invention disclosures. His research focuses on the characterization of biopolymers using advanced techniques to the development of bioproducts from biopolymers.

noureddine.abidi@ttu.edu

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