

Transforming Cellulose Nanocrystals into Sustainable Products through Surface Engineering



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Abstract: By learning from nature and using bio-based nanoparticles we can engineer sustainable high-performance materials with improved functionality. Cellulose nanocrystals (CNCs) are entering the marketplace as new ingredients for formulated chemical products. As a “green” and potentially food-grade additive, there is widespread interest in CNCs particularly as emulsifiers, rheological modifiers, and reinforcing agents.

However, the surface chemistry of CNCs must be well understood and controlled in order to elucidate the interactions, stability and compatibility with liquids, polymers and small molecules.

This lecture will describe our recent advances in hybrid nanocellulose material development and show applications in the food, health, energy and water arenas. Tailoring the location and role of CNCs at interfaces can lead us to a variety of biocompatible and enhanced emulsified products, injectable hydrogels, latex adhesives/coatings and encapsulation strategies. Furthermore, we have developed novel networked CNC structures based on chemical crosslinking which provide promising tissue scaffolds as well as universal porous substrates that are able to support other functional nanomaterials like conductive nanoparticles, carbon nanotubes and metal organic frameworks. Overall, we believe that this improved understanding can bridge the gap between scientific research and the commercialization of greener next-generation technologies.

Biography: Emily D. Cranston is an Associate Professor in Wood Science and Chemical & Biological Engineering at the University of British Columbia and is the President’s Excellence Chair in Forest Bio-products. Prior to January 2019, she was an Associate Professor at McMaster University and the Canada Research Chair in Bio-Based Nanomaterials (Tier 2). Emily’s research focuses on sustainable nanocomposites and hybrid materials from cellulose and other biopolymers. Her academic path began at McGill University where she received her Honours B.Sc. in Chemistry with bio-organic specialty and a PhD in Materials Chemistry in the group of Professor Derek Gray. The study of value-added products from cellulose took her to Stockholm, Sweden as a postdoctoral researcher at KTH Royal Institute of Technology before she returned to Canada in 2011. Emily is the recipient of the 2017 KINGFA Young Investigator’s Award from the American Chemical Society’s Cellulose & Renewable Materials division and was the 2018 Kavli Foundation Emerging Leader in Chemistry Lecturer, awarded by ACS and the Kavli Foundation.