

# **Development of an active surfactant system for crystalline nanocellulose surface polarity control**

## **Abstract**

Two of the most fundamental obstacles for the commercialization of crystalline nanocellulose(CNC) are the efficient removal of water while also allowing for material re-suspension, and the compatibilization of the polar cellulose surface for optimal dispersion in non-polar matrix materials. The applications for such processes are diverse and extend into both high volume commercial fiber-reinforced composites and paper making to lower volume high value added novel applications such as cosmetics, healthcare materials, paints and stains, waste remediation materials, and optical/electrical device systems. In all of these cases, environmental health and safety considerations are paramount, and both materials and processes used should be ecologically compatible and safe for humans. The goal of the proposed research is to develop a simple and effective procedure for the CNC surface polarity control. This will be accomplished by implementing a novel multi surfactant system that has conformational transition due to the solution pH. The proposed surfactant coating will facilitate the dewatering process, as well as prevent hydrogen bonding of the CNCs allowing them to be subsequently redispersed into non-polar matrix materials. In addition, the surfactant system proposed here consists of sustainable biologically derived surfactant molecules which are used in food products. They are all commercially available and are completely safe for humans and the environment.