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Continuous flow process for the scalable production of cellulose nanocrystals

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As oppose to widely practised batch process of producing cellulose nanocrystals (CNXLs), a continuous flow process for the scalable production process is being developed. The aim is to produce up to 1 kg of CNXLs per day, compared to the current laboratory scale of 15 grams per batch. The continuous process consists of 3 major unit operations: CNXL extraction from cotton with 64 wt% sulphuric acid (reaction), acid-CNXL separation and thereafter CNXL purification, and acid recycling. The major difficulties of the scaling up process are attributed to the nature of CNXLs, due to their small sizes and whisker-like shape and also the high amount of acid used in the process. However, these challenges have overcome through careful application of process engineering principles together with the understanding of the underlying material physical and chemical properties. The motivation of this work is to prepare the right background that will enable the incorporation of these high performance renewable nanomaterials into consumer products. Its success will also accelerate and widen the research on these nanomaterials for the development of the next generation of advance materials.

Biography

Soon Yee Liew received PhD in 2012 at University of Nottingham UK for his work in using cellulose nanocrystals as nanocomposite fillers for the fabrication of electronically conducting polymer nanocomposites. The resulting nanocomposites had very interesting properties and can be used to make high capacitance, and at the same time highly durable electrodes for use in super capacitors. He has considerable experience in nanocomposite characterisation and also electrochemical experiments. His postdoctoral work is to develop a pilot scale continuous process for the production of cellulose nanocrystals, as opposed to the widely practised batch process. In this work he thus also investigated how to continuously produce cellulose nanocrystals in the most effective way, both time and energy wise. For this he developed understanding in the field of physicochemical hydrodynamics, colloids and interfaces, and fluid mechanics.

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