

MSE-Colloquium@NTU

1 March 2023, 3:00 pm

Lecture Theatre 5 ([NS2-02-07](#))



Innovation in Sustainable Nanomaterials for Advanced Engineering Applications

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Abstract

Nanotechnology is anticipated to be the next technological wave that will drive many of the innovations in science and engineering. In this discipline, there is a renewed impetus to develop nanomaterials from renewable sources due to the negative impact of using raw materials from traditional carbon sources, such as crude oil. New opportunities in the use of sustainable and renewable materials for various advanced engineering applications exist, and cellulose nanocrystals (CNC) offer a new route to product development and formulations in many industrial sectors. Various functionalization strategies on the surface of CNC, such as with amphiphilic polymers, inorganic and metallic nanoparticles are being developed and exploited. The talk will focus on the strategies of CNC functionalization in imparting attractive properties critical for their applications. I will illustrate several innovations derived from the transformation of sustainable nanomaterials into platforms that address some of the market requirements and challenges. Some examples of the applications include wastewater treatment, anti-microbial system, conductive inks & fillers, agriculture, and water harvesting.

References:

1. Wang, Y.; Zhao, W.; Han, M.; Guan, L.; Han, L.; Hemraj, A.; Tam, K.C., Sustainable Superhydrophobic Surface with Tunable Nanoscale Hydrophilicity for Water Harvesting, *Angew. Chem. Int. Ed.* (2022), e202115238
2. Wang, Y.; Zhao, W.; Xu, J.; Zhou, X.; Luu, W.; Han, L.; Tam, K.C., Topographical Design and Thermal-Induced Organization of Interfacial Water Structure to Regulate the Wetting State of Surfaces, *JACS Au*, (2022), 2, 1989-2000.
3. Mohammed, N.; Lian, H.; Islam, M.S.; Strong, M.K.; Shi, Z.Q.; Berry, R.M.; Yu, H.Y.; Tam, K.C., Selective adsorption and separation of organic dyes using functionalized cellulose nanocrystals, *Chemical Engineering Journal*, (2021), 417, 129237

Biography

Michael Tam obtained his B.Eng. and Ph.D. degrees in Chemical Engineering from Monash University, Australia in 1982 and 1991 respectively. He spent 18 months on a postdoctoral fellowship at the Department of Chemical Engineering, McMaster University Canada, and subsequently taught at Nanyang Technological University, Singapore for 15 years. In June 2007 he joined the Department of Chemical Engineering, University of Waterloo as a tenured full professor, and holds the position of University Research Chair in the field of functional colloids and sustainable nanomaterials. He is an active member of the Waterloo Institute for Nanotechnology. His research interests are in colloids, self-assembly systems, polymer-surfactant interactions, and drug delivery systems. He has published more than 400 journal articles in various fields of polymer science and engineering. His total citation exceeds 24,390 and his H-index is 79. He is also an associate editor of *ACS Sustainable Chemistry & Engineering*.