UNIVERSITY OF DELAWARE
ENGINEERING
DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

SEMINAR SERIES

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Attend virtually: https://udel.zoom.us/j/91314568641

BACTERIAL NANOCELLULOSE PRODUCTION AND POST-PROCESSING

Bacteria can produce robust structures made of pure nanocellulose fibers via simple fermentation, and a number of research groups actively pursue their application of because of its incredible resilience, strength, and versatility. While bulk production of nanocellulose is straightforward, engineered growth of the fibers has recently been shown to enable applications like non-slip surfaces and templated biological scaffolds. Our group is interested in guiding bacterial growth of cellulose at colloidal length scales using the strong interfacial forces that are relevant there. In one example, growth of bacterial cellulose in water emulsion droplets causes the bacteria to strongly interact with the oil-water interface so that we obtain largely hollow, permeable shells of nanocellulose (nicknamed ‘jellyfish’). The high surface area fibers are an excellent substrate for selective surface modification, allowing us to explore new applications, such as uniquely deformable active particles. Confocal and light-sheet microscopy allows direct observation of the growth of nanocellulose mesh and an understanding of its unique hierarchical structure, varying in pore sizes from tens of microns to tens of nanometers depending on how the culture is grown. The extremely low density of the fiber mesh, essentially an aerogel, can be dried into very thin, strongly-bonded sheets that do not rehydrate unless their surface is modified. Selective printing of structures into the mesh allows the creation of hydration-responsive devices and sensors with tailored spatial control of internal porosity over several orders of magnitude.

ABOUT THE SPEAKER

Pat Spicer is an Associate Professor in UNSW’s School of Chemical Engineering where he leads the Complex Fluids group. The group combines microscopy and rheology studies to understand and design smart fluids with unique response and flow behaviour. Pat developed and teaches the core technology and design courses of UNSW’s new Chemical Product Engineering stream in collaboration with industrial colleagues. Before UNSW, Pat ran a central engineering group for the Procter & Gamble Company in the US for 15 years. His group developed new product and process technology there for most of P&G’s billion-dollar brands.