



Wolfson Department of Chemical Engineering Seminar
Monday, October 26th, 2020 at 15:00

Online seminar via Zoom

<https://technion.zoom.us/j/99456993920>

Multiscale Engineering of Polymer Films for Soft Devices

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Synthetic polymers have a broad range of useful thermomechanical, optoelectronic, and processing characteristics. Their macromolecular nature imparts them with unique material properties that are tunable by chemistry and processing, but also with complex hierarchical interrelationships between molecular structure, chain conformation, inter-chain packing, and performance in device operation. In particular, thin films and composites of conjugated polymers have great potential for engineering the interface between ‘soft’ materials of biology and ‘hard’ materials of conventional electronic devices. While an enormous amount of research has investigated the optoelectronic properties of such polymer films, relatively less is understood about their thermomechanical properties—which underpin many of their advantages over conventional inorganic materials. The design and optimization of robust, soft devices comprising patterned multilayer laminates of optoelectronic polymers and composites requires detailed knowledge of physicochemical phenomena from the molecular to the continuum scale. My research combines computer simulations and experiments to elucidate structure-processing-property relationships in thin films of polymers and leverages such fundamental understanding to design processing strategies and soft devices. This talk will begin with the development and results of computational and experimental approaches for investigating the thermomechanical properties of thin films of conjugated polymers. I will next present the design of a continuous process for forming thin films (~10-100 nm) using the interfacial spreading and solidification of a polymer solution at the surface of water. Finally, I will show how polymer films can be used to mimic the complex topologies and hydrostatic mechanisms found in biology to design functional robotic and healthcare devices.