Polymer Seminar

11:15 am, May 8, 2026
Science 1 - room 1002
Host: Luyi Sun

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Unlocking Polymer Thin Film Morphology Control for Biofouling, Imaging, and Drug Delivery

Abstract: Polymers are ubiquitous in modern materials, yet a major challenge persists in tailoring their nanoscale morphology for advanced applications. Traditional solution-based synthesis methods, while effective for fabricating macroscopic shapes, struggle to produce complex, controlled architectures on the microscopic scale. For example, dome-shaped microparticles, which hold significant potential for nanophotonics, immunotherapy, and other emerging fields, are not accessible by most existing methods. To address this challenge, in this talk, I will introduce an emerging vapor-phase synthesis technique based on a room-temperature variant of Chemical Vapor Deposition (CVD). This method enables the rapid, single-step fabrication of ultrathin polymer films and precisely controlled micro-domes within minutes, simultaneously achieving polymerization and morphological control. The versatility of these vapor-deposited materials has been demonstrated in diverse applications: ultrathin films act as robust antifouling surfaces, micro-domes serve as high-resolution optical lens arrays, and their potential as drug delivery platforms capable of hitchhiking on immune cells. Additionally, we integrate in-situ microscopy and artificial intelligence (AI) to autonomously optimize synthesis parameters, pointing to unprecedented control over polymer morphology and functionality. This synthesis approach advances the state-of-the-art in nanoscale polymer engineering while setting the stage for programmable soft materials tailored to specific biomedical and technological applications.

Research Website: https://theyanglab.com/

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