הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע״ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar

Monday, July 14th, 2025 at 13:30

Room 6

Responsive Colloidal Self-Assembly as a Nanotechnology Paradigm for Analog Control of Fluid Transport

Gideon Onuh

PhD Final Seminar

Advisor: Assoc. Prof. Ofer Manor
Co-Advisor: Assoc. Prof. Oz M. Gazit
Department of Chemical Engineering, Technion-Israel Institute for Technology

We investigate the design of stimuli-responsive colloidal architectures to achieve precise control over particulate self-assembly and fluid transport at micro- and nanoscales, addressing critical challenges in functional material platforms for microfluidic devices. Current colloidal systems often lack tunable interactions, resulting in limited control over assembly patterns and transport properties, which restricts their performance in applications such as drug delivery, precision agriculture, and smart separations.

Despite extensive research, scalable strategies to manipulate colloidal interactions under external stimuli remain challenging, with existing approaches often complex and difficult to adapt for diverse applications. By leveraging electrostatic, steric, entropic, and hydrogen bonding interactions, we developed scalable strategies to engineer responsive colloidal systems.

Our findings reveal that precise manipulation of colloidal interactions, encoded in their surface chemistry, via external stimuli, such as pH in our experiments, enables architectures of smart colloid systems with unprecedented control. Applications range from reinforced biological matrices to responsive colloid systems.

Refreshments will be served at 13:15.