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
Lecture Hall 6, Wolfson Department of Chemical Engineering,
Wednesday May 17th at 1:30pm

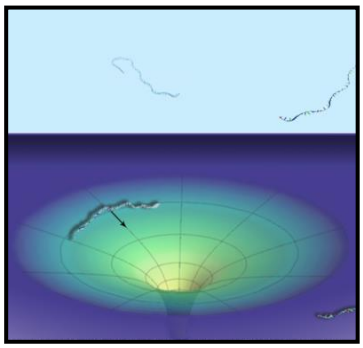
Amit Sitt

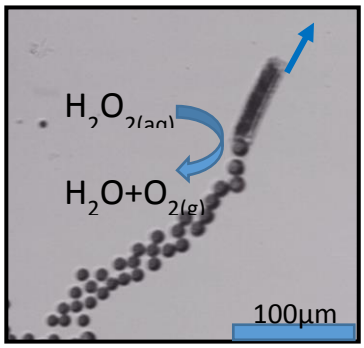
Department of Physical Chemistry, School of Chemistry
Tel-Aviv University

Microscale Transport Induced by Chemical Energy: From 2D Chemical Potential Gradients to Micro-Rockets

Precise control of the delivery and transport of materials in the nano and micro scales is essential for realizing miniaturized device technologies such as 'lab on a chip' and micro-factories, and for understanding, analyzing and manipulating cellular transport processes in biological systems. In my talk, I will discuss two mechanisms that employ chemical energy to produce autonomous transport. In the first part of the talk, I will describe the use of chemical potential gradients for establishing directional transport by converting chemical potential into mechanical energy. I will present a general theoretical framework for describing the transport of chemical species along a two–dimensional gradient, and demonstrate how such mechanism can be employed for transport of molecules in hydrogels modified with a chemical gradient of binding sites.

In the second part of the talk, I will present a novel type of biodegradable micro-rockets that exhibit autonomous movement through catalytic bubble-thrust propulsion. I will discuss the fabrication process of microscale polymeric Janus-tubes, and focus on the ability to chemically bind catalytic species inside the tubes, which upon exposure to hydrogen peroxide lead to propulsion of the tubes by oxygen bubbles expulsion. I will compare the effect of different catalysts on the obtained velocity, and discuss the ability to use different catalysts for clean propulsion in biological environments.





Refreshments will be served at 13:15