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, February 12th, 2020 at 13:30

The study of microemulsion nanostructure by cryogenic electron microscopy

Irina Davidovich

Advisor: Prof. Yeshayahu Talmon

Microemulsions are thermodynamically stable, macroscopically isotropic liquid systems of water, oil, and surfactant. The importance of microemulsions is due to their unique properties such as ultra-low interfacial tension, high thermodynamic stability, high interfacial area, and the ability to solubilize immiscible liquids. The microemulsions may be successfully used in all fields that require mutual mixing of hydrophilic and hydrophobic substances, such as drug delivery, catalysis processes, separation, and many other processes. The increased understanding of microemulsion formation, stability and dynamics contribute to the growth of their industrial uses.

Depending on the chemical nature of the components and the thermodynamic conditions, microemulsions may self-assemble into different structures. One of the most interesting features of nonionic microemulsions is a continuous phase transition from a water- continuous to an oil-continuous microemulsion that forms the isotropic one-phase channel for constant surfactant concentration.

The one-phase corridor of nonionic microemulsions was well investigated using a wide variety of experimental techniques. However, there were only a few attempts to directly image the nanostructures formed in it. In our work, we used cryogenic-temperature transmission electron microscopy (cryo-TEM) and cryogenic-temperature scanning electron microscopy (cryo-SEM) to fully characterize the nanostructural transitions along the one-phase corridor of the isooctane-water-$C_{12}E_5$ system.

Shear-induced particle migration in viscous fluids

Peleg Ragonis
Advisor: Prof. Nir Avinoam

Shear-induce diffusion is the phenomenon of particle migration in a sheared suspension of high particle concentration. Analyses and measurements were mostly aimed, so far, at suspensions with uniform particle size. However, in most practical systems the suspension particles possess a continuous size distribution. This work addresses such suspensions for the first time.

We present a model that is based on moments of the particle sizes and volume fraction. Test cases of steady and dynamic states are addressed, and various profiles are approximated and shown for flow of the suspension in a tube. The main effects involve particle migration that result in non-uniform concentration distribution, flattening of the velocity profile and particle size separation.

Refreshments will be served at 13:15