Complex Liquids/Nanostructure/Macromolecules
Technion-Israel Institute of Technology

Mrs. Sofia Napso
Department of Chemical Engineering, Technion
Under the supervision of Prof. Yachin Cohen and Dr. Dmitry Rein
Will talk on

"Cellulose-Coated Oil-in-Water Emulsions"

Cellulose is the most inexhaustible natural polymer on earth, with intriguing structure and properties. Given nowadays growing attention of environmental problems and global shortage of fossil resources, developing and utilizing cellulose for different applications is of great interest. However, cellulose dissolution, which is essential for its further use, has been a real challenge over the years, and much effort has been invested in finding efficient and environmentally benign solvents for cellulose. We recently discovered that cellulose chains are molecularly dissolved in a solvent mixture of an ionic liquid with certain polar organic solvents, forming a true solution without significant aggregation of the dissolved chains. The structure and dynamics of these solutions are characterized by cryogenic transmission electron microscopy (cryo-TEM) imaging, rheological and small-angle x-ray scattering (SAXS) measurements. Furthermore, we discovered that the cellulose solutions or suspensions of regenerated cellulose hydrogel particles can be used for facile fabrication of cellulose-encapsulated oil-in-water or water-in-oil emulsions by utilizing cellulose as an emulsifier, without the use of additional surfactants. The emulsion droplets were imaged by cryo-TEM, light scattering and confocal light microscopy, verifying the existence of cellulose-coated oil droplets. The structure of the cellulose coating, in terms of its thickness and density, are studied by small-angle neutron scattering (SANS) experiments.

Mr. Gilad Alfassi
Department of Chemical Engineering, Technion
Under the supervision of Prof. Yachin Cohen and Dr. Dmitry Rein
Will talk on

"A Process for the Enzymatic Degradation of Cellulose"

This research focuses on an economically viable technology for non-food biomass (cellulose) hydrolysis, thus providing a sustainable pathway for ethanol production. To do so, we engineered the spatial structure of the cellulose chains by creating an amorphous regenerated cellulose dispersions followed by fabrication of emulsion particles. Additionally we tried to modify the supramolecular cellulose structure in order to enhance hydrolysis.
The results show significant improvement in glucose production when the amorphous cellulose hydrogel is dispersed on a micro-scale. Further improvement observed in the hydrolysis of emulsion particles. Our best improvement was achieved by a novel modification process of the cellulose chains. We found a cellulose dissolution process in ionic liquid that results in a slight modification rendering the cellulose water-soluble. This leads to an overwhelming increase in the hydrolysis rate – 70% of the cellulose is degraded in less than 5 minutes.

Tuesday, 5 July 2016
11:00, Room 108, Chemical Engineering Building