Bar-Ilan University
אוניברסיטת בר-אילן

Faculty of Exact Sciences
Department of Chemistry

הפקולטה למדעים מדויקים
המחלקה לכימיה

S E M I N A R

Monday 11/12/17, 12:00 pm

Building 211, seminar room

SPEAKER:

Dr. Tamar Segal-Peretz
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Technion- Israel Institute of Technology

TOPIC:

Understanding and Controlling 3D Nanostructures: From Block Copolymers to Selective Inorganic Materials Growth

Nanostructures are the fundamentals building blocks for many technological applications such as photovoltaic, energy storage, membranes, and semiconductor devices. To meet the demands of these applications, precise control over the nanoscale dimensions and tailored functionality of the nanostructure is needed. Self-assembly of block copolymers is known for its nanoscale ordered morphology and scalable manufacturing processes and is therefore considered a promising pathway for nanostructure formation. Among the challenges to realize this promise are: (1) the ability to control the assembly in three dimensions, and (2) engineering the nanostructure functionality and improving its performance.

In this talk I will discuss methods for controlling the three-dimensional assembly of block-copolymers (BCP) using guiding chemical pre-patterns and will demonstrate how better understanding of the 3D structure can be achieved through transmission electron microscopy (TEM) tomography. Functionalization of the BCP nanostructure was performed by selective growth of metal oxides in one microdomain of the BCP using sequential infiltration synthesis (SIS) process. The SIS growth was utilized as a new staining technique for BCP imaging as well as building material in BCP-templated metal oxide ultrafiltration membranes. 3D characterization, using scanning TEM tomography, enabled us to probe hidden structures and to analyze the through-film morphology, changes in feature's roughness with depth, and the formation of defects in directed self-assembled lamellae for nanofabrication, and cylindrical structure in separation membranes. Future prospects of the SIS process and its applications in functional nanostructures will be discussed.