Russell Berrie Nanotechnology Institute
Technion - Israel Institute of Technology

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Institute for Molecular Engineering
University of Chicago and Argonne National Laboratory

"Directed self-assembly of performance materials"

Monday,
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12:00 refreshments
12:30 lecture

Wang Auditorium
The Dalia Maydan Building
Faculty of Materials Science and Engineering

RBNI Monthly Seminar Series 2018

TECHNION
Israel Institute of Technology

Directed self-assembly of performance materials

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Over the past decades, manufacturing techniques have been developed with such remarkable efficiency that it is now possible to engineer complex systems of heterogeneous materials at the scale of a few tens of nanometers. Further evolution of these techniques, however, is faced with difficult challenges in terms of feasibility of implementation at the scale of 10 nm and below, and prohibitively high capital equipment costs. Materials that self-assemble, on the other hand, spontaneously form nanostructures down to length scales at the molecular scale, but the micrometer areas or volumes over which the materials self-assemble with adequate perfection in structure is incommensurate with the macroscopic dimensions of devices and systems of devices of industrial Directed self-assembly (DSA) refers to the integration of self- .relevance assembling materials with traditional manufacturing processes to enhance and augment capabilities, often at drastically reduced cost. Here I will discuss the use of lithographically defined chemically patterned surfaces to direct the assembly of block copolymers for semiconductor manufacturing, block copolymer electrolytes for ion-conducting membranes, and liquid crystal based systems for optoelectronics. In addition, I will highlight how DSA enables unprecedented characterization and optimization of DSA materials and processes using combinations of ultra-high information experiments (electron microscopy and x-ray probes) and theory (molecular simulation).