

THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT  
SPRING COLLOQUIUM SERIES PRESENTS:

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## *Vapor-Phase Growth of Inorganic Materials within Polymers-Fabrication by Design of Functional Nanostructures*

Nanofabrication techniques are the enabling tools for numerous developments in nanotechnology. In the last several years, a new technique, named sequential infiltration synthesis (SIS), has emerged from atomic layer deposition (ALD). Unlike thin film deposition of ALD, in SIS, the vapor-phase precursors infiltrate into a polymer and react with the polymer moieties, resulting in growth within the polymer volume and the formation of hybrid organic-inorganic materials. The confined growth and precursor-polymer interactions bridge the world of polymer and ceramics, creating hybrid materials with synergic properties. Combining SIS with self-assembled block copolymer (BCP) patterns results in selective growth of inorganic materials within the polar domains of the BCP, making it an attractive method for directed templating of inorganic nanostructures.

In this talk, I will present an overview of SIS technology and discuss our latest research on SIS mechanism and applications. By combining in-situ growth analysis, high-resolution electron microscopy imaging, and 3D electron tomography characterization as well as quantum mechanical calculations, we shed light on SIS diffusion-limited growth and its relationship to the polymer chemistry, precursor chemistry, and SIS process conditions. We explore SIS in homopolymer and BCP films, nanoparticles, and fibers. The capabilities and potential of SIS in nanofabrication are demonstrated in various systems including BCP-metal oxide membranes with tuned 3D pore structure, BCP-templated porous metal oxide nanoparticles, and 3D heterostructures nanorod arrays fabricated via simultaneous but spatially-controlled growth of two metal oxides.

**Tamar Segal-Peretz** is an Assistant Professor at the Wolfson Department of Chemical Engineering, Technion- Israel Institute of Technology. She received her PhD from the Technion followed by a Director's Postdoctoral Fellowship at Argonne National Laboratory and at the Institute for Molecular Engineering in the University of Chicago. Tamar Segal-Peretz's group, the Functional Nanostructure and Advanced Imaging (FNAI) group, focuses on understanding and developing new functional nanostructures for nanofabrication processes, membranes, and optical materials using polymer self-assembly and inorganic materials growth within polymers. The FNAI group utilizes and develops various 2D and 3D electron microscopy characterization techniques to probe nanostructures.

**Tuesday, April 27 • 4 PM CDT • Zoom**

Registration is required. [RSVP link.](#)

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