

Block Copolymer-Based Nanocomposite Films: Hierarchical Structures by Chemical Design

Roy Shenhar

The Hebrew University of Jerusalem, Edmond J. Safra Campus, Jerusalem 9190401, Israel

roys@huji.ac.il

Organizing metal and semiconductor nanoparticles into ordered arrays with nanoscale structure represents a major challenge in nanotechnology, and bears the potential to advance applications such as sensing and photovoltaics beyond their current performance limits.

A highly modular approach for organizing nanoparticles into ordered structures involves the utilization of block copolymers. Block copolymers consist of different sequences of chemically distinct repeat units, and spontaneously form periodic nanoscale structures by microphase separation. Tailoring the chemistry of the nanoparticle's protecting monolayer to be compatible with one block of the polymer enables harnessing the inherent structure of the block copolymer to order the nanoparticles. Nanocomposite films prepared by blending such nanoparticles with block copolymers feature periodic structures, in which nanoparticles reside in alternating domains.

The presentation will describe design principles and discuss the main factors that govern nanoparticle-block copolymer assembly in thin nanocomposite films. Questions that will be addressed are:

- How can we control the **internal nanoparticle structure** inside a domain?
- How the nanoparticle **shape** influences the overall morphology?
- How can we use **block copolymer architecture** to further enhance nanoparticle ordering?

References

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