



Periodic Polymeric Materials for NanoTechnology

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Nanotechnology requires control of materials from the atomic to the 100 nanometer to the macroscopic level. Exploiting the size and shape dependence of material properties and accessing multi-functionality holds great promise for the development of materials that will contribute to novel future technologies. Polymers are a class of materials that have a very broad range of properties and moreover, can act as hosts for metallic and dielectric nanoparticles as well as organic molecules, resulting in nanocomposites with combinations of properties not available by other means. Periodic structural assemblies are of particular interest, due to their interesting interactions with waves: especially electromagnetic and mechanical waves. Progress in this exciting area requires excellent control of structure formation. A top-down, bottom-up approach, involving interference lithography and self assembly is demonstrating good success in fabricating the requisite structures and desired properties from periodic polymers for applications in photonics and phononics.

Professor Edwin L. (Ned) Thomas is the Morris Cohen Professor and Head of the Materials Science and Engineering at MIT. Currently he serves as the Founding Director, Strategic Planning for the Institute for Soldier Nanotechnologies at MIT. His research interests include polymer physics and engineering, photonics and phononics and mechanical and optical properties of block copolymers, liquid crystalline polymers, and hybrid organic-inorganic nanocomposites. In 2000, he and others from MIT co-founded OmniGuide Inc., a Cambridge, Massachusetts company that pioneered flexible carbon dioxide laser fibers for precision surgery. Before coming to MIT, he founded and served as co-director of the Institute for Interface Science and was head of the Department of Polymer Science and Engineering at the University of Massachusetts. Thomas is the recipient of the 1991 High Polymer Physics Prize of the American Physical Society and the 1985 American Chemical Society Creative Polymer Chemist Award. He was elected a Fellow of the American Physical Society in 1986 and a Fellow of the American Association for the Advancement of Science in 2003 and Inaugural Fellow of the Materials Society in 2008. He coauthored the undergraduate textbook *The Structure of Materials* and a research monograph, *Periodic Materials: Photonics, Phononics and Mechanics*, and has published over 350 papers and holds thirteen patents.

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