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Modeling the Physical Properties of Nanocrystal Superlattices



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ABSTRACT:

Nanocrystal superlattices are materials formed by assembly of monodisperse nanocrystal building blocks that are tunable in composition, size, shape, and surface functionalization. Such materials offer the potential to realize unprecedented combinations of physical properties, but theoretical prediction of such properties remains a challenge. In this talk I will discuss different modeling approaches used in my group to compute the physical properties of nanocrystal superlattices. Specifically, I will cover their mechanical, thermal, and vibrational properties. If time permits, I will also discuss our recent work on one-way transport in elastic waveguides.

BIOGRAPHY:

Jennifer R. Lukes is currently Professor of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania. Her research activities are directed toward understanding the unusual thermal, fluid, and mass transport phenomena that emerge as the characteristic dimensions of devices and materials approach the nanometer scale. Her primary focus has been the development and application of computational methods to investigate the thermal transport characteristics of nanostructures such as carbon nanotubes, superlattices, nanowires, and ultrathin solid films. Professor Lukes received her B.S. in Mechanical Engineering magna cum laude from Rice University in 1994 and was elected to Phi Beta Kappa that same year. Following her undergraduate studies, she worked in industry as a facility engineer at Amoco Production Company. A National Science Foundation Fellow, she returned to academia and earned her M.S. and Ph.D. degrees in Mechanical Engineering at the University of California, Berkeley in 1998 and 2001. She joined the Department of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania in September 2002 as William K. Gemmill Assistant Professor. Professor Lukes received the National Science Foundation CAREER Award in 2006. In 2007 she was selected to participate in the National Academy of Engineering's U.S. Frontiers of Engineering Symposium, and in 2011 she was invited to the National Academy of Sciences' Indonesian-American Kavli Frontiers of Science Symposium. A member of the American Society of Mechanical Engineers and the Materials Research Society, she has organized technical sessions, symposia, and a conference in the area of nanoscale thermal transport.