Mechanical & Aerospace Engineering

seminar

Flexoelectricity

April 1, 2016 at 1:30pm in SCOB 228

abstract

Classical mechanics is intrinsically size-independent and as such does not distinguish between structures that are self-similarly scaled from miles to nanometers. In this presentation, I will discuss a specific physical phenomenon (flexoelectricity) that leads to size-effects in electromechanical coupling. I will argue, through computational examples, the tantalizing possibility of creating "apparently piezoelectric" materials without piezoelectric materials—e.g. graphene, emergence of "giant" piezoelectricity at the nanoscale, nanocapacitors for energy storage and a peculiar indentation size-effect in ferroelectrics. I will also briefly discuss the ramifications of flexoelectricity for soft materials and biological membranes.

Pradeep Sharma
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biosketch

Pradeep Sharma is the M.D. Anderson Professor and Chair of Mechanical Engineering. He also has a joint appointment in the Department of Physics. He received his Ph.D. in micromechanics of materials (mechanical engineering) from the University of Maryland at College Park in the year 2000. Subsequent to his doctoral degree, he was employed at General Electric R & D for more than three years as a research scientist. There he worked in two simultaneous programs on Nanotechnology and Photonics apart from basic research in problems of theoretical and computational materials science. He joined the department of mechanical engineering at University of Houston in January 2004. His honors and awards include the Young Investigators Award from Office of Naval Research, Thomas J.R. Hughes Young Investigator Award from the ASME, Texas Space Grants Consortium New Investigators Program Award, the Fulbright fellowship, the Melville medal and the University of Houston Research Excellence Award. He is a fellow of the ASME, the associate editor of the Journal of the Mechanics and Physics of Solids and serves on the editorial board of several other journals.