

Mechanical Engineering Seminar Series

April 14, 2026, 11:00AM

EIS 104

Title: Characteristic Nanoscale Deformation, on Large-area Coherent Graphite Moiré Patterns

Dr. Prabhkar Bandaru
University of California, San Diego

Abstract: Highly oriented pyrolytic graphite may be the only known monatomic crystal with the ability to host naturally formed moiré patterns on its cleaved surfaces, which are coherent over micrometer scales and with discrete sets of twist angles of fixed periodicity. Such an aspect is in marked contrast to twisted bilayer graphene and other multilayered systems, where the long-range coherence of the moiré is not easily maintained due to twist angle disorder.

We will indicate the electro-mechanical response of coherent graphite moiré patterns through inducing external strain from scanning tunneling microscopy tip-induced deformation. Consequently, *unique* anisotropic mechanical characteristics are revealed. For example, a lateral widening of one-dimensional domain walls (DWs) bridging Bernal (ABA) and rhombohedral (ABC) stacking domains (A, B, and C refer to the carbon atomic layer positioning), may be indicated. Further, *in situ* tunneling spectroscopy as a function of the deformation indicated a tendency towards increased electrical conductance, which may be associated with a higher density of electronic states, and the consequent *flattening* of the electronic energy band dispersion. Such features were probed across the DWs, with implications for strain-induced electronic modulation of the moiré characteristics.

Bio: Prab Bandaru is a professor of Mechanical Engineering in UC, San Diego and is affiliated with the Electrical Engineering, Nanoengineering, and Physics departments. His research group is interested in analytical and experimental materials physics and chemistry and related applications, broadly looking at the electrical, thermal, electrochemical, photonic, and mechanical properties of materials at the nano-, meso-, and macro-levels.

Related research accomplishments range from synthesis of new magneto-optic materials, establishing the maximum efficiency for thermoelectrics, measurement of the electrical conduction at the single molecule level, use of helical and Y-shaped carbon nanostructures for inductors and nanoelectronics, non-contact optical measurements of thin film thermal conductivity, sub 1 nanometer pore diagnostics in single layer graphene, *etc.* Professor Bandaru has been recognized through awards such as the Flint Seminar lectureship at Yale University and the Scientific American Top 50.