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Spectroscopic and Microscopic Analysis of Graphene for Sensor Applications TAMANNA KHAN, CHAO QIU, JOHN CIUBUC, Department of Physics, University of Texas at El Paso, El Paso, TX, KEVIN BENNET, Division of Engineering, Department of Neurologic Surgery, Mayo Clinic, Rochester, MN, WILLIAM DURRER, Department of Physics, University of Texas at El Paso, El Paso, TX, FELICIA MANCIU, Department of Physics, Border Biomedical Research Center, University of Texas at El Paso, El Paso, TX, MAYO CLINIC, ROCHESTER, MN TEAM, UNIVERSITY OF TEXAS AT EL PASO, EL PASO, TX TEAM — As a two-dimensional material, graphene shows very good thermal and electrical conductivities, which, with its unique optical properties, makes it suitable for a variety of applications. In this study we present detailed investigations by confocal Raman and Drude model analysis of the material's changes and improvements, as it transitioned from 3D graphite to 2D graphene. Besides Raman spectral recording, which can detect single, a few, and multi-layers of graphene, confocal Raman mapping allows distinction of such domains and direct visualization of material inhomogeneity. Moreover, far-infrared transmittance measurements, which are related to electrical conductivity, demonstrate a distinct increase of conductivity with dimensionality reduction. These measurements are particularly suited to determining important material characteristics, including time constant (the inverse of the average time between two carrier-core collisions), carrier concentration, and conductivity by using a Drude-like model. Such information is valuable for developing bio-medical sensors, which is the main application envisioned for this work.

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