Infrared Optoelectronic Properties and Applications of Monodisperse Carbon Nanomaterials

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BIOGRAPHY

Mark C. Hersam: Mark C. Hersam is currently a Professor of Materials Science and Engineering, Chemistry, and Medicine at Northwestern University. He earned a B.S. in Electrical Engineering from the University of Illinois at Urbana-Champaign (UIUC) in 1996, M.Phil. in Physics from the University of Cambridge in 1997, and a Ph.D. in Electrical Engineering from UIUC in 2000. In 1999, he also performed research at the IBM T. J. Watson Research Laboratory under the support of an IBM Distinguished Fellowship. His research interests include nanofabrication, scanning probe microscopy, semiconductor surfaces, and carbon nanomaterials. As a faculty member, Dr. Hersam has received several awards including the Beckman Young Investigator Award, NSF CAREER Award, ARO Young Investigator Award, ONR Young Investigator Award, Sloan Research Fellowship, Presidential Early Career Award for Scientists and Engineers, TMS Robert Lansing Hardy Award, AVS Peter Mark Award, ECS SES Research Young Investigator Award, MRS Outstanding Young Investigator Award, and five Teacher of the Year Awards. In recognition of his early career accomplishments, Dr. Hersam was directly promoted from assistant professor to full professor with tenure in 2006. In 2007, Dr. Hersam co-founded NanoIntegris, which is a start-up company focused on supplying high performance carbon nanomaterials. Dr. Hersam is a Fellow of MRS and SPIE in addition to serving as the Chair of the AVS Nanometer-scale Science and Technology Division and as Associate Editor of *ACS Nano*.

TECHNICAL ABSTRACT

Carbon nanomaterials have attracted significant attention due to their potential to improve applications such as infrared optoelectronics, transistors, transparent conductors, solar cells, batteries, and biosensors [1]. This talk will highlight our latest efforts to develop solution-phase strategies for purifying, functionalizing, and assembling carbon nanomaterials into functional arrays. For example, we have recently developed [2,3] and commercialized [4] a scalable technique for sorting surfactant-encapsulated single-walled carbon nanotubes (SWCNTs) by their physical and electronic structure using density gradient ultracentrifugation (DGU). The DGU technique also enables multi-walled carbon nanotubes to be sorted by the number of walls [5,6], and graphene to be sorted by thickness [7,8], thus expanding the suite of monodisperse carbon nanomaterials. The resulting monodisperse carbon nanomaterials enhance the performance of field-effect transistors [9,10], high frequency electronics [11,12], digital circuits [13], infrared optoelectronic devices [14,15], sensors [16], structural composites [17], transparent conductors [18], catalysts [19], and photovoltaics [20,21]. By extending our DGU efforts to carbon nanotubes and graphene dispersed in biocompatible polymers (e.g., DNA, Pluronics, and Tetronics) [22-24], new opportunities have emerged for monodisperse carbon nanomaterials in biomedical applications.

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