MAR12-2011-008291

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

**Terahertz Dynamics in Carbon Nanomaterials**[1]

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This NSF Partnerships for International Research and Education (PIRE) project supports a unique interdisciplinary and international partnership investigating terahertz (THz) dynamics in nanostructures. The 0.1 to 10 THz frequency range of the electromagnetic spectrum is where electrical transport and optical transitions merge, offering exciting opportunities to study a variety of novel physical phenomena in condensed matter. By combining THz technology and nanotechnology, we can advance our understanding of THz physics while improving and developing THz devices. Specifically, this PIRE research explores THz dynamics of electrons in carbon nanomaterials, namely, nanotubes and graphene — low-dimensional, $sp^2$-bonded carbon systems with unique finite-frequency properties. Japan and the U.S. are global leaders in both THz research and carbon research, and stimulating cooperation is critical to further advance THz science and to commercialize products developed in the lab. However, obstacles exist for international collaboration — primarily linguistic and cultural barriers — and this PIRE project aims to address these barriers through the integration of our research and education programs. Our strong educational portfolio endeavours to cultivate interest in nanotechnology amongst young U.S. undergraduate students and encourage them to pursue graduate study and academic research in the physical sciences, especially those from underrepresented groups. Our award-winning International Research Experience for Undergraduates Program, NanoJapan, provides structured research internships in Japanese university laboratories with Japanese mentors — recognized as a model international education program for science and engineering students. The project builds the skill sets of nanoscience researchers and students by cultivating international and inter-cultural awareness, research expertise, and specific academic interests in nanotechnology. U.S. project partners include Rice University, the University of Florida, the University of Tulsa, the State University of New York at Buffalo, Southern Illinois University at Carbondale, and Texas A&M University. Japanese partners include: Osaka University, Chiba University, Shinshu University, Tohoku University, the University of Tokyo, the National Institute of Information and Communications Technology, the National Institute of Materials Science, Hokkaido University, RIKEN, and the University of Aizu.

[1]This PIRE project is cofunded by the Office of International Science and Engineering, the Division of Electrical, Communications, and Cyber Systems, and the Division of Materials Research of the National Science Foundation.