Photonics and optoelectronics with carbon nanotube crystalline films

Abstract: One of the grand challenges in nanoengineering and nanoscience today is how to create macroscopic materials and devices by assembling nano-objects while preserving their rich variety of unprecedented properties that are promising for new applications. Carbon nanotubes make an ideal one-dimensional material platform for the exploration of exotic physical phenomena under extremely strong quantum confinement. Although extraordinary electronic, thermal, and optical properties in individual carbon nanotubes have been continuing to attract interest in various disciplines, including chemistry, materials science, physics, and engineering, the macroscopic manifestation of such properties is still limited, despite significant efforts for decades. In this talk, I will first introduce a new method, controlled vacuum filtration, to address the long-standing problem of preparing wafer-scale films of crystalline chirality-enriched carbon nanotubes. Such films immediately enable exciting new fundamental studies and applications. I will then summarize recent discoveries in optical spectroscopy studies and optoelectronic device applications using films prepared by this technique.

Biography

Dr. Weilu Gao received his B.S. degree in electrical engineering from Shanghai Jiao Tong University in 2011 and his Ph.D. degree in electrical and computer engineering from Rice University in 2016. He is currently a postdoctoral researcher in the group of Prof. Junichiro Kono in the Department of Electrical and Computer Engineering at Rice University. Dr. Gao was a recipient of the National Scholarship for Outstanding Self-Financed Students Abroad, Chinese Government in 2016. His research interests are in photonics and optoelectronics of nanomaterials, including single-wall carbon nanotubes and two-dimensional materials, spanning fundamental research to applications in health, energy, imaging, sensing, computing and communication. He has more than 30 publications, and they have been cited over 1700 times in total.