Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Anisotropic Terahertz Response of Highly Aligned Single-Walled Carbon Nanotubes L. REN, X. WANG, L. BOOSHEHRI, D. HILTON, J. KONO, ECE Dept., Rice University, C. PINT, R. HAUGE, Chemistry Dept., Rice University, D. RANA, K. TAKEYA, I. KAWAYAMA, M. TONOUCHI, Inst. of Laser Eng., Osaka University — Dynamic conductivities of degenerate 1-D electrons are expected to provide a wealth of information on quantum confinement, electron interactions, and disorder. Here, we use terahertz time-domain spectroscopy (THz-TDS) to determine the complex dielectric function of a thin film of highly aligned single-walled carbon nanotubes (SWNTs) on sapphire. The THz electromagnetic wave used was linearly polarized, and the measured dielectric function was very anisotropic. As the angle between the nanotube axis and the THz electric filed changed, anisotropy was clearly observed for both the real and imaginary parts of the dielectric function. The absorption of the THz wave decreased monotonically with increasing angle from 0 to 90 degrees, with maximum and minimum absorption at 0 and 90 degrees, respectively. Through a proper model, the complex dynamic conductivity was extracted and showed a non-Drude-like frequency dependence, with the real part increasing monotonically with increasing frequency between 0.2 and 1.8 THz.

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Date submitted: 02 Dec 2008 Electronic form version 1.4