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Strong anisotropy in the THz absorption spectra of stretch-aligned single walled carbon nanotubes Y. IWASA, N. AKIMA, H. MATSUI, N. TOYOTA, Tohoku University, S. BROWN, A. M. BARBOUR, J. CAO, J. L. MUSFELDT, University iof Tennessee, M. SHIRAISHI, Osaka University, H. SHIMODA, O. ZHOU, University of North Carolina — Polarized THz spectroscopy is crucial for understanding the low-energy electronic structure and carrier dynamics in single walled carbon nanotubes (SWNTs), as well as for exploring polarization-sensitive THz applications. We prepared stretch-aligned SWNT/polymer composites, and measured the polarized absorption spectra from the THz through the visible region. The low-frequency electronic excitations are predominantly polarized parallel to the tube direction. The peak centered near 100 cm^{-1} is discussed in terms of a curvature-induced gap and a plasmon resonance due to a finite size/wavelength effects in the SWNTs. The broad middle infrared structure that is observed in unoriented films with spaghetti-like morphology disappears in stretch-aligned samples, suggesting that this middle infrared feature may be due to in-gap states in the semiconducting tubes caused by the highly disordered morphology of the unoriented films. Hole doping effects were also investigated, and conversion of semiconducting tubes to more conducting ones is demonstrated.

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