Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Chirality-Dependent Electron-Hole Asymmetry in Single-Walled Carbon Nanotubes Probed by Direct Observation of Transverse Quasi-Dark Excitons[1] YUHEI MIYAUCHI, Columbia University and Kyoto University, HIROSHI AJIKI, Osaka University, SHIGEO MARUYAMA, The University of Tokyo — We studied the electron-hole (e-h) asymmetry between valence and conduction bands in single-walled carbon nanotubes (SWNTs) through the direct observation of spin-singlet transverse dark excitons using polarized photoluminescence excitation spectroscopy. The intrinsic e-h asymmetry lifts the degeneracy of the transverse exciton wavefunctions at two equivalent K and K' valleys in momentum space, which gives finite oscillator strength to transverse dark exciton states. Chirality-dependent spectral weight transfer to transverse dark states was clearly observed, indicating that the degree of the e-h asymmetry depends on the specific nanotube structure. Based on comparison between theoretical and experimental results, we evaluated the band asymmetry parameters in graphene and various carbon nanotube structures.

[1]One of the authors (YM) was financially supported by JSPS (No. 20-3712)

Yuhei Miyauchi
Columbia University and Kyoto University

Date submitted: 19 Nov 2009 Electronic form version 1.4