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Intrinsic BWF-lineshape Observed by Raman Scattering in Isolated Metallic Carbon Nanotubes JANINA MAULTZSCH, YANG WU, Columbia University, ERNST KNOESEL, Rowan University, BHUPESH CHANDRA, MINGYUAN HUANG, MATT SFEIR, LOUIS BRUS, JAMES HONE, TONY HEINZ, Columbia University — Broadened and asymmetric lineshapes for Raman scattering in the high-energy (or G) modes of metallic carbon nanotubes have been reported for many years. There remains, however, controversy about whether this behavior is an intrinsic feature of metallic nanotubes or is induced by perturbations. To address this issue, we have examined isolated metallic nanotubes suspended in air, with chiral indices determined independently by Rayleigh scattering and Raman measurements of the radial breathing mode. Our data show that strong broadening (to FWHM > 50/cm) and weak asymmetry are typical of the high-energy Raman modes, with lineshapes describable by a Breit-Wigner-Fano (BWF) form. Significant variation in peak width and Raman shift is, however, observed as a function of the nanotube chiral index. Indeed, some metallic nanotubes have lineshapes and widths that are very similar to those of semiconducting nanotubes. We will discuss the observed variation and the origin of the BWF lineshape.

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