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Rapid widefield Raman imaging of individual carbon nanotubes
ROBIN HAVENER, SANG-YONG JU, MICHAEL SEGAL, LIHONG HERMAN, JIWOONG PARK, Cornell University — Raman spectroscopy is a powerful tool for characterizing carbon nanotubes. Confocal micro-Raman imaging can provide detailed spatial and spectral information about individual nanotubes, but this technique is often time-consuming. We present a widefield Raman microscope capable of rapid and large-area imaging of carbon nanotube samples. Thanks to a widefield excitation geometry, a high-power excitation laser (3W in our experiment) can be used without causing thermal damage to nanotubes, which dramatically shortens image acquisition time ($\sim$20sec for G- band for a 60μm field of view). With a custom-built tunable bandpass filter, our widefield Raman images let us quantitatively compare the D, G and 2D-band intensities of many nanotubes with different known resonant energies, diameters, and metallicities, while providing the Raman scattering cross-section length for individual nanotubes. This technique allows Raman-based spatially resolved investigation of dynamic processes in nanotubes for the first time, which we demonstrate by real-time imaging of the oxidation of nanotubes at high temperatures.

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