Photon antibunching in single-walled carbon nanotubes at telecommunication wavelengths and room temperature

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Toward the spread of quantum information technology such as quantum communications to the general public, the development of quantum light sources, which can operate at room temperature and telecommunication wavelength, are required. In this study, we measured the photoluminescence (PL) of individual air-suspended SWNTs over the telecommunication wavelength range and a range of temperatures and investigated the time-resolved PL and photon antibunching properties. Air suspended SWNTs were grown on a line-and-space patterned silicon substrate, and the PL was measured from 6 to 300 K. We carried out photon correlation measurements with a Hanbury-Brown-Twiss setup, and observed the first photon antibunching in the telecommunication wavelength range at room temperature [1]. This high-temperature photon antibunching can be explained by the exciton diffusion in a suspended SWNT taking into account exciton-exciton annihilation (EEA) and end quenching investigated by Monte Carlo simulation, which was recently reported in Ref. 2. We expect that future developments will see the application of this antibunching behavior of SWNTs for high-efficiency single photon emitters at telecommunication wavelength and room temperature [3,4].

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