

Spectral tuning of optical coupling between air-mode nanobeam cavities and individual carbon nanotubes

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We design high quality factor air-mode nanobeam cavities by finite-difference time-domain simulations, and utilize the cavities to enhance the emission of air-suspended carbon nanotubes [1]. The cavities are fabricated from silicon-on-insulator wafers, and nanotubes are synthesized over the cavities by chemical vapor deposition. Photoluminescence spectroscopy is performed on the devices, where we observe optical coupling when the nanotube emission energy is close to the cavity resonance. Taking advantage of laser-heating-induced blueshifts of the nanotube emission, we can reduce the detunings [2]. We derive and numerically calculate the generalized expression for the spectral overlap, and good correlation to the enhancement factors is obtained.

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