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Enhancement of photoluminescence from single-walled carbon nanotubes by photonic crystal microcavities[1] R. WATAHIKI, T. SHIMADA, P. ZHAO, S. CHIASHI, S. IWAMOTO, Y. ARAKAWA, S. MARUYAMA, Y.K. KATO, The University of Tokyo — Single-walled carbon nanotubes are bright nanoscale emitters, while photonic crystal microcavities offer the possibility for efficient optical coupling at the nanoscale because of their small mode volumes and high quality factors. Here we report on the enhancement of photoluminescence from single-walled carbon nanotubes by L3 cavities in hexagonal lattice photonic crystals. Free-standing photonic-crystal membranes are fabricated from silicon-on-insulator substrates, and micelle-encapsulated carbon nanotubes are dispersed on the devices. We observe sharp peaks with a typical spectral width of 0.4 nm which corresponds to a quality factor of ∼3000. As the peaks appear at wavelengths longer than those of Si photoluminescence, they are attributed to carbon nanotube emission coupled to the microcavity modes. We find that the photoluminescence intensity is enhanced by more than a factor of four compared to luminescence from an unpatterned area.

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