Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Photoluminescence microscopy on air-suspended carbon nanotubes coupled to photonic crystal nanobeam cavities[1] R. MIURA, S. IMAMURA, T. SHIMADA, R. OHTA, S. IWAMOTO, Y. ARAKAWA, Y.K. KATO, The University of Tokyo — Because carbon nanotubes are room-temperature telecom-band emitters and can be grown on silicon substrates, they are ideal for coupling to silicon photonic cavities.[2,3] In particular, as-grown air-suspended carbon nanotubes show excellent optical properties, but cavity modes with large fields in the air are needed in order to achieve efficient coupling. Here we investigate individual air-suspended nanotubes coupled to photonic crystal nanobeam cavities. We utilize cavities that confine air-band modes which have large fields in the air. Dielectric mode cavities are also prepared for comparison. We fabricate the devices from silicon-on-insulator substrates by using electron beam lithography and dry etching to form the nanobeam structure. The buried oxide layer is removed by wet etching, and carbon nanotubes are grown onto the cavities by chemical vapor deposition. We perform photoluminescence imaging and excitation spectroscopy to find the positions of the nanotubes and identify their chiralities. For both types of devices, cavity modes with quality factors of ∼3000 are observed within the nanotube emission peak.

[1]Work supported by SCOPE, KAKENHI, The Telecommunications Advancement Foundation, The Toyota Physical and Chemical Research Institute, Project for Developing Innovation Systems of MEXT, Japan and the Photon Frontier Network Program of MEXT, Japan.
[2]R. Watahiki et al., Appl. Phys. Lett. 101, 141124 (2012).
[3]S. Imamura et al., Appl. Phys. Lett. 102, 161102 (2013).

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Date submitted: 14 Nov 2013 Electronic form version 1.4