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Localized Guided-Mode and Cavity-Mode Double Resonance in Photonic Crystal Nanocavities[1] XUQING LIU, TAKASHI SHIMADA, RYOHEI MIURA, SATOSHI IWAMOTO, YASUHIKO ARAKAWA, YUICHIRO K. KATO, The University of Tokyo — We investigate the use of guided modes bound to defects in photonic crystals for achieving double resonances. Photoluminescence enhancement by more than three orders of magnitude has been observed when the excitation and emission wavelengths are simultaneously in resonance with the localized guided mode and cavity mode, respectively. We find that the localized guided modes are relatively insensitive to the size of the defect for one of the polarizations, allowing for flexible control over the wavelength combinations. This double resonance technique is expected to enable enhancement of photoluminescence and nonlinear wavelength conversion efficiencies in a wide variety of systems. For example, such tuning of double resonance would be particularly effective for carbon nanotubes that show sharp absorption peaks [1].

[1] R. Watahiki, T. Shimada, P. Zhao, S. Chiashi, S. Iwamoto, Y. Arakawa, S. Maruyama, and Y. K. Kato, Appl. Phys. Lett. 101, 141124 (2012).

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