

Single dot near-field spectroscopy for photonic crystal microcavities

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The experiments of cavity quantum electrodynamics phenomena for single quantum dot (QD) strongly coupled to electromagnetic field rely on the construction of optical microcavities with high quality factors (Q) and small modal volumes (V). It was demonstrated that such kind of microcavities can be fabricated using thin photonic crystal membranes¹. However the realization of the strong coupling regime in these cavities is prevented by problems with spatial and spectral matching of the quantum dot exciton and the cavity mode. Here we demonstrate how the near-field optical scanning microscopy can be utilized for the spectral matching by tuning the emission energy of single QD using nanoindentation by near-field optical fiber probe. We present the results of fabrication and micro-photoluminescence characterization of triangular lattice photonic crystal microcavities containing InAs quantum dots (emission wavelength 1.2 μm). Preliminary results of near-field characterization of these photonic crystal microcavities are also presented.

1. J. Vuckovic and Y. Yamamoto, *Appl. Phys. Lett.* **82**, 2374 (2002); K. Hennessy, C. Reese, A. Badlato, C. F. Wang, A. Imaoglu, P. M. Petroff and E. Hu, *Appl. Phys. Lett.* **82**, 2374 (2002).