

Nanowire Coupling to Photonic Crystal nanocavities for Single Photon Sources

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In this work, we demonstrate efficient evanescent coupling to ultra-small ($0.5 (\lambda/n)^3$) high Q PhC cavities, via a tapered silica fiber nanowire [1]. The cavity has been specifically designed and realized for SPS applications and exhibits modes with a high Purcell factor [2]. We show that the cavity-nanowire system displays unique properties that are especially relevant to SPS applications. This system provides a flexible and non-invasive approach to tune the Q , λ properties of the cavity mode. Firstly, this approach allows one to adjust the coupling strength in order to achieve substantial extraction efficiency while maintaining a high Purcell factor. Secondly, the coupling technique can also tune the cavity wavelength in order to match it to the QD emitter wavelength, enabling an actual spontaneous emission (SE) rate enhancement via the Purcell effect.

[1] C. Grillet, et al, Opt. Express **14**, 1070-1078 (2006).

[2] J. Vuckovic, and Y. Yamamoto, Appl. Phys. Lett. **82**, 2374-2376 (2003).