

All-Optical Control of Light in Ultrahigh-Q Photonic Crystal Cavities

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Recently, we have realized ultrahigh-Q nanocavities using with-modulated line defects in Si photonic crystal slabs. We confirmed that they have Q of 1.2 million by independent spectral and time-domain measurements. In this talk, we will describe how we apply high-Q cavities to various optical phenomena and applications. First, we show that we have realized significant slowing down of light propagation using ultrahigh-Q cavities [1]. Secondly, we discuss the impact for all-optical switching operation. Thirdly, we investigate dynamic tuning phenomena for ultras-small and high-Q cavities, and demonstrate that interesting adiabatic wavelength conversion [2] and optomechanical energy conversion [3] are possible for such systems.

- [1] T. Tanabe et al., *Nature Photonics*, **1**, 49 (2007).
- [2] M. Notomi et al., *Phys. Rev. A* **73**, 051803(R) (2006).
- [2] M. Notomi et al., *Phys. Rev. Lett.*, **97**, 023903 (2006).