InAs/InP single quantum dot photonic crystal waveguides

R. L. Williams, K. Mnaymneh, S. Frédérick, D. Dalacu, P. J. Poole, J. Lapointe, G. C. Aers
Institute for Microstructural Sciences, National Research Council, Canada

Single InAs/InP quantum dots emitting in the telecoms band around λ = 1550 nm can be nucleated at selected sites using directed self-assembly techniques [1]. These same dots can then be incorporated within photonic crystal microcavities [2] for application as vertically emitting single photon sources.

For in-plane applications, individual dots can be incorporated within photonic crystal microcavities which are then coupled to waveguides [3] or the dots themselves can be directly embedded within a photonic crystal waveguide as shown in Fig. 1. In both cases, the microcavity and waveguide characteristics can be designed to match the spectral characteristics of individual dots measured prior to photonic crystal fabrication. In the work presented here, we will discuss the optical characterization of such structures and show how slow-light engineering of the waveguides can be used to optimize the coupling between a quantum dot embedded within a microcavity and an adjacent waveguide.

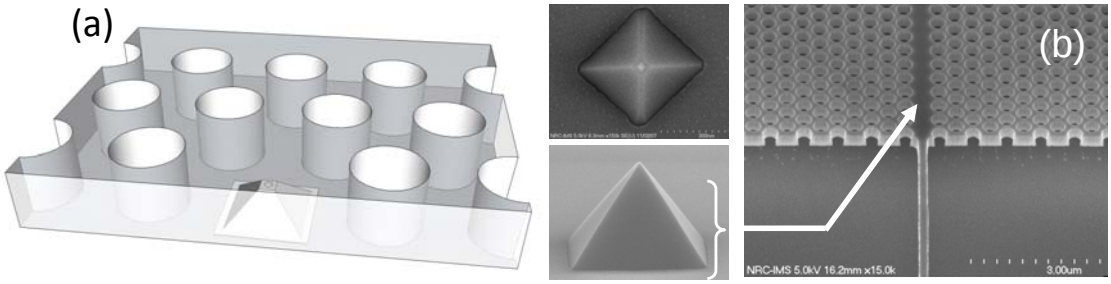

Fig. 1. (a) Schematic illustration showing the alignment of a single, site controlled InAs/InP quantum dot to the defect site of a membrane microcavity. (b) SEM images of a single dot waveguide device at various stages of fabrication.

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3. K. Mnaymneh, S. Frédérick, D. Dalacu, J. Lapointe, P. J. Poole, and R. L. Williams, *Optics Lett.* **37**, 280 (2012).