Experimental demonstration of a high quality factor photonic crystal microcavity

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Abstract Sub-threshold measurements of a photonic crystal (PC) microcavity laser operating at 1.3 µm show a linewidth of 0.10 nm, corresponding to a quality factor (Q) ~ 1.3x10⁴. The PC microcavity mode is a donor-type mode in a graded square lattice of air holes, with a theoretical Q ~ 10⁵ and mode volume V_{eff} ~ 0.25 cubic half-wavelengths in air. Devices are fabricated in an InAsP/InGaAsP multi-quantum well membrane and are optically pumped at 830 nm. External peak pump power laser thresholds as low as 100 µW are also observed.