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Voltage-controlled Deformation of Photonic Crystal Membranes HUBERT J. KRENNER, Materials Department, UC Santa Barbara CA 93106, H. KIM, S. M. THON, D. BOUWMEESTER, Physics Department, UCSB, N. G. STOLTZ, P. M. PETROFF, Materials Department, UCSB — We present a novel photonic device consisting of a free-standing Photonic Crystal (PC) membrane which can be mechanically deformed by an external voltage. This is realized by introducing doped layers in the membrane and the underlying substrate. We embed self-assembled InAs quantum dots (QDs) in the membrane as active emitters. In a first step metal contacts are fabricated for both doped layers of the device. Twodimensional PC microcavities are defined by electron beam lithography and ICP etching. The PC membrane is finalized by selectively removing an AlGaAs layer underneath the patterned region. By applying a bias voltage between the two contacts we are able to change the electrostatic force between the substrate and the membrane analogous to a plate capacitor. Due to the small thickness of the membrane the electrostatic force leads to a deformation with vertical displacements up to 250nm at room temperature. We demonstrate that at low temperatures this displacement can be reversibly changed over a wide range by an external voltage leading to a visible deformation of the membrane. We present first results of micro-PL experiments to probe the influence of the deformation on the optical modes of PC microcavities. - Supported by the Alexander-von-Humboldt Foundation

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