Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Self-assembled quantum dots as active emitters for silicon photonic crystal nanocavities THOMAS ZABEL, NORMAN HAUKE, STEFAN LICHTMANNECKER, FABRICE LAUSSY, RICHARD GEIGER, JONATHAN FINLEY, Walter Schottky Institut, Technical University Munich, Germany, GERHARD ABSTREITER, Walter Schottky Institut, Technical University Munich, Institute for Advanced Study, Technical University Munich, Germany, DOMINIQUE BOUGEARD, Institut fuer Experimentelle und Angewandte Physik, University Regensburg, Germany, YASUHIKO ARAKAWA, University of Tokyo, Inst. for Nano Quant. Inform. Electr., Inst. of Ind. Sci., Tokyo, Japan, Institute for Advanced Study — We present a study of the properties of active (Si)Ge self-assembled quantum dot (QD) emitters coupled to Si photonic crystal (PC) nanocavities up to room temperature and evaluate the potential of such nanostructures for the realization of efficient silicon based light sources in the near-infrared regime. The Si-Ge system allows the formation of type I and type II band alignment QD, depending on the epitaxy conditions. We first discuss the emission properties of different types of QD. In particular we present type I SiGe islands designed to produce a strong emission due to a large wave function overlap of confined electrons and holes. We then investigate the coupling properties of (Si)Ge QD emitters to 2D Si PC cavities. We interpret the experimentally observed correlation between the photoluminescence intensity of the QDs and the quality factor of the PC cavity using simulations based on a dissipative master-equation approach [1]. As a further step towards efficient light sources, we currently study the coupling of electrically pumped (Si)Ge QDs to 2D PC in contacted diode structures. [1] N. Hauke, et al. Phys. Rev. B 84, 085320 (2011)

Thomas Zabel
Walter Schottky Institut, Technical University Munich, Germany

Date submitted: 11 Nov 2011 Electronic form version 1.4