lars based on a finite element method (FEM). The modes are either obtained by solving an eigenvalue or a scattering problem. Good agreement to experimental data is demonstrated and various influences on the quality (Q) factor of the fundamental pillar mode are investigated.

On the one hand we determine absolute maximum Q factors which depend on the absorption of the semiconductor cavity material. On the other hand geometrical parameters are varied in detail to calculate their influence: Pillar diameter and sidewall inclination show critical features with respect to the Q factor. Furthermore, the top and bottom Bragg stacks are modified in the number of pairs and the etching depth.

15 min. break

HL 43.8 Thu 11:45 POT 151

Polaritonic band gaps in gold films covered with high-refractive index gratings — •Alexander Sprafke, Karl Weis, and Gero von Plessen — Institute of Physics (1A), RWTH Aachen University, 52056 Aachen, Germany

In structured noble-metal films, surface-plasmon polaritons (SPPs) can be excited optically. SPPs consist of electromagnetic surface waves accompanied by longitudinal electron-density waves. Polaritonic crystals made from planar metal films covered with dielectric gratings have been shown to exhibit band gaps in the polariton dispersions. Here, we experimentally and theoretically investigate the polaritonic band gaps of gold films coated with high-refractive index (n > 2) gratings. The band-gap widths achievable in these structures are studied. In particular, the dependence of the band-gap width on the refractive index and filling factor of the gratings are discussed. We find that the polaritonic band-gap collapses for certain combinations of these parameters. Furthermore, strong variations of the polariton line width as a function of the refractive index and filling factor are predicted.

HL 43.9 Thu 12:00 POT 151

Feature size reduction of silicon inverted direct laser written photonic crystal structures — •Isabelle Staude[1,2], Martin Hermatschweiler[1,3], Georg von Freymann[1,3], and Martin Wegener[1,2,3] — [1]DFG-Centrum für Funktionale Nanostrukturen (CFN), Universität Karlsruhe (TH), 76128 Karlsruhe — [2]Institut für Angewandte Physik, Universität Karlsruhe (TH), 76128 Karlsruhe — [3]Institut für Nanotechnologie, Forschungszentrum Karlsruhe GmbH, 76021 Karlsruhe

Direct laser writing of photonic crystal polymer templates in combination with a subsequent silicon double inversion procedure allows for the fabrication of high quality photonic band gap materials [1]. However, for structures made along these lines, the fundamental band gap has so far been located in the spectral range well above 2 microns wavelength, disqualifying the procedure for applications at telecommunication wavelengths. We could now demonstrate experimentally that feature sizes can be reduced with an improved fabrication scheme. Modifications mainly affect the pre- and post-exposure treatment of the employed photoresist SU-8. The crucial step consists of omitting the standard post-exposure bake relying on optical curing as suggested in [2]. In this manner we have realized silicon woodpile photonic crystal structures with 600 nm lateral rod distance showing prominent photonic stop bands centred around 1.4 microns wavelength, where suppression of transmittance of up to two orders of magnitude is achieved.

[1] N. Tétreault *et al.*, Adv. Mater. **18** (4), 457 (2006)
[2] K. K. Seet *et al.*, Appl. Phys. Lett.. **89** (2), 024106 (2006)

HL 43.10 Thu 12:15 POT 151

Localization limits in slow light photonic crystal waveguides — •Alexander Petrov and Manfred Eich — Technische Universität Hamburg-Harburg, E-12, Eissendorfer Strasse 38, D-21073 Hamburg, Germany

The disorder in photonic crystal waveguides leads to distributed back scattering of guided modes. The backscattering intensity scales with inverse group velocity squared and leads to localization phenomena in slow light waveguides. The use of slow light components above the localization length is not possible due to the phase distortion of the signal. The reflection at a single defect is calculated with eigenmode expansion method and localization lengths are estimated as functions of group velocity in 1D and 2D photonic crystal structures. The effect of absorption and vertical scattering as well as gain on localization phenomena is discussed. It is demonstrated that absorption and vertical scattering effectively diminish localization phenomena and allow use of longer slow light components, whereas gain enhances localization and should be used carefully in slow light structures.