tact leads to a Schottky-barrier and a corresponding electrostatic potential in the semiconductor. This potential is different within the aperture, i.e., at the semiconductor-insulator-air interface. As this electrostatic potential adds to both, the energy of the conduction band and the conduction band energy, it is not expected to be red-shifted. For larger optically excited regions, the charges completely screen this potential and the spatially direct, spectrally unshifted luminescence is recovered. This reasoning explains all the unusual linear and nonlinear features seen in our experiments.

References

QM04 4:45 pm
Coherent Imaging of local fields in photonic crystals

Using focused ion beam milling we succeeded to fabricate various low-dimensional photonic crystals. The waveguides used as basis for all our structures are Si$_3$N$_4$ ridges with a width and height of 1.5µm and 5µm, respectively.

Figure 1a shows a focused ion beam image of the conventional ridge waveguide containing an array of 15 air rods (diameter of the air rods: 110 nm, period: 220 nm). An interferometric PSTM image of light inside the structure is depicted in figure 1b. Most of the intensity is confined in the waveguide region. After passing the periodic air rod region, two intense beams are diffracted under an angle of approximately 20 degrees. The periodicity of the horizontal stripes (phase fronts) corresponds to the wavelength of light in the material. A pure phase image is shown in figure 1c. A variety of different phase singularities is revealed outside the waveguide. Additionally, circular shaped waves with their origin in the region of the 15 air rods can be seen. In the periodic air rod region, a slightly different refractive index than the one of the material can be determined from the local spacing between the phase fronts.

To investigate the scattering behavior of 15 air rods, experiments for a range of different wavelengths (585nm - 647nm) of incoupled light are performed. Figure 2 depicts a line plot of the intensity along the waveguide axis. In front of the air rod array, a standing wave is built up due to interference between incoming and backreflected light. The modulation depth of the standing wave reveals the reflection coefficient of the structure. In the region of the periodic air rod array, a wave-length dependent attenuation is found.

In conclusion, heterodyne interferometric photon scanning tunneling microscopy gives detailed insight in reflected and transmitted waves as they develop through periodic structures. Ultimately, this method will allow us to visualize the opening of a stop gap in one or two-dimensional photonic crystals.


QM05 5:15 pm
A pyramidal silicon probe with an extremely high throughput and resolution for optical near field technology
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For improvement in the performances of spatially resolved spectroscopy, optical data storage, and so on, we demonstrate here an extremely high throughput and resolution capability of a