K 3: Poster

Time: Tuesday 16:45–17:45 Location: HSZ OG2

K 3.1 Tue 16:45 HSZ OG2

Organic distributed feedback lasers based on laser-inscribed periodic surface structures — •Tiange Dong, Tobias Antrack, Jakob Lindenthal, Markas Sudzius, Johannes Benduhn, and Karl Leo — Dresden Integrated Center for Applied Physics and Photonic Materials (IAPP) and Institute of Applied Physics, Technische Universität Dresden, 01062, Dresden, Germany

Laser ablation, as one of the well-approved alternative methods of photo-lithography in microfabrication, is limited in structuring resolution by the diffraction limit. However, it was observed that a laser-induced periodic surface structure (LIPSS) can be formed under ultrafast laser irradiation, and the periodicity resolution is significantly smaller than the wavelength of the incident laser (λ/2-λ/10). In this work, the periodic structure generated by LIPSS was utilized to build a distributed feedback (DFB) laser based on organic materials. The femtosecond laser (λ = 515 nm) was used to structure the SiO2 substrate, forming a surface grating with a periodicity of about 200 nm. Afterwards, an organic blend (Alq3:DCM, 450 nm thick) was evaporated on the top of the grating as an optically active waveguide. Photo-induced laser emission of the devices was measured under femtosecond optical pumping at 404 nm. We observed a narrow single peak laser emission at 620nm wavelength, which demonstrates optical feedback from the underlying 1st-order DFB structure. Our results show the potential of a laser-induced periodic surface structure to organic photonic devices and microlasers based on the artificially produced photonic structures on a subwavelength scale using laser micromachining techniques.

K 3.2 Tue 16:45 HSZ OG2

Spectroscopic Pump-Probe-Reflectometry of NIR Excited Silicon — •Philipp Lungwitz, Nick Börnert, Theo Pflug, and Alexander Horn — Laserinstitut Hochschule Mittweida, Technikumplatz 17, 09648 Mittweida

Ultrashort pulsed laser radiation with photon energies below the indirect bandgap of silicon enables the in-volume structuring of wafers due to multiphoton processes. Therefore, laser sources with wavelength in near infrared (NIR) spectral range are increasingly common for processing semiconductors. During laser mater interaction of ultrashort pulsed laser radiation (λ_{pump} = 1950 nm, τ_{H} < 50 fs) with silicon, the resulting nonlinear excitation of electrons by NIR radiation also affects to the optical properties in the visual spectral range. Imaging pump-probe reflectometry enables the measurement of the transient reflectivity for different probe wavelengths (420 nm ≤ λ_{probe} ≤ 1000 nm, $\tau_{\mathrm{H}} \approx 40$ fs) and time delays up to $\Delta t = 500$ ps after irradiation. Assigning the spatial coordinates to local fluences allows a fluence dependent interpretation as well. Below the fluence for material modification H_{th}, a reduction of reflectivity was detected which become more and more significant with an increasing probe wavelength. For fluences above H_{th}, the reflectivity increases rapidly after irradiation and features a local minimum between $\Delta t = 2$ ps and $\Delta t = 50$ ps for all probe wavelengths.