

Preface

In the year 2014, remarkable progress has been achieved by the three research groups of the Institute of Optoelectronics, as detailed below. Five Ph.D. students have obtained their Dr.-Ing. degrees.

The VCSELs and Optical Interconnects Group has launched new projects which are conducted in close collaboration with Philips U-L-M Photonics located in Science Park II next to the university campus in Ulm. With electro-optical vertical-cavity surface-emitting laser (VCSEL) modeling we are supporting the development of efficient and temperature-stable lasers suited for 28 Gbit/s digital modulation. Using straintronic techniques we are modifying the optical anisotropy in VCSELs, which is useful for spintronic operation of these lasers. A record-high birefringence of about 250 GHz has been obtained. Furthermore, heterojunction phototransistors with quantum well absorber are investigated in vertical resonant-cavity configurations.

In the GaN Group, we continued our studies about semipolar GaN, where good planar layers could be grown for several semipolar orientations on patterned sapphire wafers. Complete LED structures could be realized, although their electro-optic characteristics are still inferior to c-plane LEDs. First experiments towards semi-insulating GaN grown by hydride vapor phase epitaxy using ferrocene as doping precursor have also been done. GaN-based nanowires grown on N-polar GaN templates show promising performance for sensor applications.

In the High-Power Semiconductor Laser Group, an optically pumped semiconductor disk laser making use of quantum well pumping has been realized. A record continuous-wave output power of close to 7 W has been achieved for a pump wavelength of 940 nm and an emission wavelength of 984 nm. Due to the low quantum defect, the device operates at room temperature and does not need any sophisticated cooling setup, e.g., the use of diamond heat spreaders.

In a major effort to use floor-space in the University West campus more efficiently, the VCSELs and Optical Interconnects Group has entirely rearranged their optical laboratories. This has allowed the GaN Group to move laboratories back to the main location of our Institute in building 45.

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