HL 44: Focussed Session: Frontiers in Laser Diode Physics II

Organizers: Tim Wernicke(TU Berlin), and André Strittmatter (OvGU Magdeburg)

Time: Thursday 15:00–16:00 Location: EW 202

Invited Talk HL 44.1 Thu 15:00 EW 202

Development of AlGaN based UV Laser Diodes — •Ronny Kirste[1,2], Biplab Sarkar[1], Seiji Mita[1,2], Will Mecouch[1,2], James Tweedie[1,2], Qiang Guo[1], Andrew Klump[1], Ramon Collazo[1], and Zlatko Sitar[1] — [1]North Carolina State University, Raleigh, NC, USA — [2]Adroit Materials, Cary, NC, USA

The AlGaN materials system offers unique opportunities to develop next generation UV lasers with emission ranging 210 to 350 nm. However, despite many efforts, no electrically injected laser diode with emission wavelength < 320 nm has been demonstrated yet. Among others, challenges for these devices include low doping efficiency, low carrier injection efficiency, absorbing layers and defects, and non-ohmic contacts. Here, we present recent advances in the growth and fabrication of UV laser diodes on single crystal AlN substrates. We will discuss all steps needed to achieve electrically injected UV lasing. First, it is shown that the MOCVD growth on AlN substrates results in high quality AlGaN layers with low defect concentration and excellent doping capabilities. Next, the design of the active region (MQW) is discussed and low threshold optically pumped lasing is demonstrated. Taking into account simulation results, the design and growth of a complete UV laser diode is shown and fabrication challenges are analyzed. Finally, we present electrical data and electroluminescence spectra from fabricated diodes and discuss the challenges that need to be addressed to realize the first electrically injected mid UV laser diode.

Invited Talk HL 44.2 Thu 15:30 EW 202

Semiconductor Nanolasers Based on 2D Monolayer of Transition Metal Dichalcogenides — •Cun-Zheng Ning — Department of Electronic Engineering, Tsinghua University, and School of Electrical, Computer & Energy Engineering, Arizona State University

This talk will begin with a brief review of the major progress in semiconductor nanolasers over the last decade and the potential applications of such nanolasers in the future integrated nanophotonic chips. The first part of the talk will be on semiconductor nanolasers with surface-plasmonic confinement mechanisms, including discussions of merits and major problems of plasmonics in metallic structures. The focus of the talk will be on the more recent progress in semiconductor nanolasers using a 2D monolayer of transition metal dichalcogenides as optical gain medium, potentially the thinnest gain medium possible. We will show some remarkable results of integrating a silicon nanobeam cavity structure with a monolayer of molybdenum ditelluride, demonstrating room temperature lasing in continuous wave mode for the first time. Concluding remarks and future perspectives will be provided towards the end of presentation.