

## 3<sup>rd</sup> International Conference and Exhibition on **Lasers, Optics & Photonics**

September 01-03, 2015 Valencia, Spain

### Type-II quantum wells for InP-based surface and edge emitting lasers

Stephan Sprengel and M C Amann

Technische Universität München, Germany

Lasers operating in the near- and mid-infrared have many applications - Medical sensing, surgeries, biosensing and contactless highly sensitive gas detection. In this range, InP-based edge emitting lasers and VCSELs using type-I Quantum Wells (QW) offer excellent performance up to 2.3  $\mu\text{m}$  wavelength. Beyond this wavelength, edge emitting lasers based on GaSb demonstrate low thresholds up to 3.7  $\mu\text{m}$ . For VCSELs as well as for III-V on silicon concepts, on the other hand, GaSb is not the material of choice, since the process as well as growth technology are not as far developed as for InP. In this talk we present an innovative concept for InP-based edge emitters and VCSELs for 2-3  $\mu\text{m}$ , using type-II QWs. In the center, three type-II quantum wells are implemented. Each consists of a GaAsSb hole-confining QW surrounded by two GaInAsQWs for electron confinement, forming a W shaped band structure. These W-shaped QWs are separated by tensile strained GaAsSb. Additionally, the structure includes electron and hole blocking layers for electrical confinement. For optical confinement, wave guiding and cladding layers are surrounding the structure. We present lasers at 2.5  $\mu\text{m}$  with threshold current densities of only 0.31  $\text{kAcm}^{-2}$  extrapolated to infinite length corresponding, to 0.1  $\text{kAcm}^{-2}$  per QW. Furthermore laser at 2.7  $\mu\text{m}$  are presented, operating up to 80°C in pulsed mode. Additionally, a concept for InP-based type-II VCSELs is discussed. First VCSEL results at 2.5  $\mu\text{m}$  wavelength are very promising.

#### Biography

Stephan Sprengel was born in Erding, Germany, in 1987. He received the Dipl. Phys. degree from the Technische Universität München, Germany in 2012. Since then he has been working towards the Ph.D degree at the Walter Schottky Institut, Technische Universität München. Currently he is engaged in the research on InP and GaSb-based type-I and type-II quantum well lasers, LEDs and Photodiodes for the mid infra-red including design, epitaxial growth, manufacturing and characterization. He is a member of the Deutsche Physikalische Gesellschaft, and the IEEE Photonics Society.

[stephan.sprengel@wsi.tum.de](mailto:stephan.sprengel@wsi.tum.de)

#### Notes: