SCIENTIFIC FEDERATION
ABODE FOR RESEARCHERS

2nd Global Summit & Expo on
Laser Optics & Photonics

June 14-16, 2018 at Rome, Italy

Ruijun Wang
Ghent University-IMEC, Belgium

Workshop on
III-V-on-silicon mid-IR photonic integrated circuits

Mid-infrared III-V-on-silicon photonic integrated circuits (ICs) promise to enable low cost and miniature optical sensors for trace-gas detection, bio-sensing and environmental monitoring. Among different group IV photonics platform, silicon-on-insulator (SOI) waveguide circuits allow operation up to around 4 μm wavelength, germanium-on-silicon and germanium-on-SOI can be used for the wavelength range beyond 4 μm. Silicon-on-insulator waveguides with a loss of ~0.5 dB/cm and ~3 dB/cm are obtained in the 2 μm and 3.8 μm wavelength range, respectively. For germanium waveguides, a loss of ~3 dB/cm is obtained in the 5 μm wavelength range. Active opto-electronic components are integrated on the photonic IC by the integrating III-V materials. III-V-on-silicon 2.3 μm range distributed feedback (DFB) lasers can operate up to 25 °C in continuous-wave regime and shows an output power of 3 mW. By varying the silicon grating pitch, a DFB laser array with broad wavelength coverage from 2.28 μm to 2.43 μm is achieved. III-V-on-silicon photodetectors with the same epitaxial layer stack exhibit a responsivity of 1.6 A/W near 2.35 μm. In addition, we also report a 2 μm range GaSb/silicon hybrid external cavity laser with tuning range more than 58 nm and side mode suppression ratio better than 60 dB. In the 3 μm wavelength range, GaSb-based p-i-n photodetectors heterogeneously integrated on the silicon waveguide platform are demonstrated. In the 5μm wavelength range, high-efficiency grating couplers, thermo-optic heaters and widely tunable Vernier ring resonator filters are realized on germanium waveguides platform. These germanium ICs can be integrated with III-V semiconductor quantum cascade or interband cascade gain chips to realize miniaturized widely tunable lasers.

Biography

Ruijun Wang has received his Ph.D. degree from Ghent University in 2017. Now he is a postdoctoral researcher at Photonics Research Group of Ghent University-IMEC. He has published more than 35 papers in international journals and conferences. He is currently working on III-V-silicon photonic integrated circuits for the mid-infrared wavelength range. His current research interests includes integrated photonics, frequency combs and high-speed photonic devices.