第38回 GRL 浜松セミナー

~ 若手研究者のための光・電子・情報科学に関する情報交換～

Mid-Infrared Lasers Based on GaSb: From New Physical Insights to a Start-Up Commercial Company

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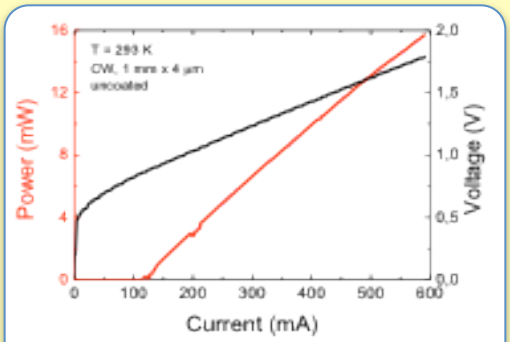

Fig.1. Typical RT L-I-V data for a type-I device at 2 µm.

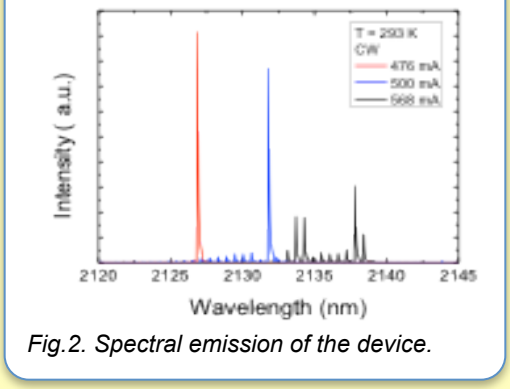

Fig.2. Spectral emission of the device.

Type-I mid-infrared laser diodes based on GaSb have long been a promising material and technology platform for room-temperature laser diodes for the 2-4µm wavelength range. However, long-wavelength laser diodes required complex materials such as quaternary GaInAsSb or AlGaAsSb and even quinternary AlGaInAsSb, which have been reported to be very demanding in terms of epitaxial growth and fabrication technology, in addition to thermal instability, known as the “blue shift” effect and the miscibility gap. In our work at Brolis Semiconductors, we demonstrate that $Al_xGa_yIn_{1-x-y}As_zSb_{1-z}$ based materials to be very stable and controllable once proper technological conditions are met, and can be applied for type-I laser diode development in the entire 1.8-4.0 µm wavelength range utilizing the intrinsic advantages of the type-I optical transition - high gain and low voltage drop - leading to continuous wave operation at room temperature, with threshold input D.C. power less than 50 mW, transparency current density at infinite length < 50 A/cm^2 per QW, operating voltage < 1V and room-temperature emission up to 3.73 µm. Such performance is of particular interest for field applications requiring long battery life-time such as remote sensing systems, defense or handheld systems. At the same time, low input powers contribute to less self-heating, which is advantageous for high-power device (laser bars and stacks) development for illumination, material processing and military countermeasure applications.

Augustinas Vizbaras has received BS from Vilnius University, Lithuania in 2007, MSc in Physics from KTH, Sweden and completed his PhD studies at TU Munich, Germany in 2012 on mid-infrared and terahertz optoelectronic device technology and molecular beam epitaxy. He has authored over 30 publications in peer-reviewed scientific journals and international conference proceedings (9 invited). In 2011 he co-founded Brolis Semiconductors, a company, developing type-I GaSb mid-infrared laser diodes and molecular beam epitaxy of Sb-based materials. Since 2011, Brolis Semiconductors raised more than 5 million USD (～五億円) for research and development

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