Nanosemiconductor GmbH Announces Breakthrough Results in Semiconductor Laser Temperature Stability

Nanosemiconductor GmbH, an advanced facility for growth of nano-epitaxy wafers for semiconductor lasers, announced results achieved by Prof Bhattacharya's group of the University of Michigan which demonstrates complete temperature stability of key parameters over the temperature range 0-80C for 1.3 micron edge-emitting semiconductor lasers. Temperature stability has been one of the holy grails of semiconductor laser research since the invention of lasing action in semiconductors in 1961. "The temperature stability demonstrated by our Quantum Dot technology and our MBE manufacturing expertise eliminates the need for a TEC (thermo-electric cooler) and complex feedback photo-detector circuitry to keep the operating power constant over temperature, which translates into cost savings and manufacturing simplification for makers of optical transceivers" said Bernd Meyer, CEO of Nanosemiconductor GmbH

Developed over the past decade, the Nanosemiconductor approach uses Quantum Dot technology on Gallium Arsenide (GaAs), along with a patented "Defect Reduction Technology" (DRT). "Lasers based on our technology have a high differential efficiency and quite a low threshold current density, which reduces the power requirements of laser transceivers" said Nikolai Ledentsov, the Chief Scientific Officer. "In addition, the reduced linewidth enhancement factor in Quantum Dots is advantageous for low-chirp operation, making it possible to dramatically suppress beam filamentation, resulting in better output light quality", he added.

Prof Bhattacharya's group processed the Nanosemiconductor wafers into 400 by 3 micron ridge waveguide lasers with HR coating on one facet, demonstrating a slope efficiency (η) of 0.4 W/A and a threshold current (Ith) of 5 mA over the temperature rang 0C to 80C. "From being a mere curiosity, self-organized quantum dot lasers have now emerged as a formidable technology, thanks to the painstaking research conducted by a number of groups around the world." said Prof Bhattacharya, adding "These devices have demonstrated ultra-low threshold current, high output power and efficiency, ultra-low chirp, linewidth enhancement factor less than unity, and a large modulation bandwidth. Now, with the demonstration of temperature independent operation, quantum dot lasers truly behave like atomic lasers."

"It is very satisfying to see such practical realization of years of advanced research" said Prof. Zh. Alferov, the Nobel Prize winning Head of the Abram Ioffe Institute and Honorary Chairman of Nanosemiconductor's Scientific Board. He went on to add, "I feel that this is just the start of further breakthroughs with Quantum Dot technology which will transform the field of semiconductor lasers"

Indeed, Nanosemiconductor has been quite busy in this area, recently demonstrating the first 1.5 μm Fabry-Perot lasers based on GaAs as well as s 1.3 μm VCSEL (Vertical Cavity Surface Emitting Laser) also based on GaAs, including devices with both undoped and doped distributed Bragg reflectors. In addition, the team is working at the proof-of-concept stage on a number a novel patented in-house design concepts including a Tilted Cavity Laser and an electronically tunable VCSEL.

About Nanosemiconductor GmbH

Located in Dortmund (Germany), Nanosemiconductor, originally spun-out of the Abram Ioffe Physical-Technical Institute, St. Petersburg, Russia, offers innovative compound semiconductor epitaxy products and technologies. In particular, its patented Defect Reduction (DRT) and Quantum Dot technologies enable tangible improvements in cost, performance, and quality in compound semiconductor devices used in opto- and micro-electronics. Current applications include lasers for telecommunications and lighting, as well as high-performance transistors.