Nikolay Ledentsov, J Material Sci Eng 2017, 6:1 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.058

Recent progress in epitaxial quantum dots for lasers and light emitting diodes

Nikolay Ledentsov
VI Systems GmbH, Germany

Epitaxial quantum dots (QDs) resulted in multiple breakthroughs in physics of zero-dimensional structures and allowed advancements of optoelectronic devices. Most importantly, these tiny structures provided unique opportunities to modify and extend all basic principles of heterostructure lasers and light emitting diodes and extend their applications. The breakthrough occurred when techniques for self-organized growth allowed the fabrication of dense arrays of coherent islands, uniform in shape and size and simultaneously free from undesirable defects. The work on the development of the technology for such QDs contributed enormously to the progress in material science. First ever lasing at low and at room temperatures was achieved in self-organized QDs in 1993 (photo pumped, at equivalent current densities of 4 kA/cm^2). At that time, the term quantum dots were not yet fully established and the 3D quantized structures were referred to as quantum clusters. Injection lasing was realized soon after. Since that time, a lot of progress has been made extending the wavelengths, performance and application ranges of QD lasers. Control over the processes during QD formation and application of post-QD-deposition defect reduction techniques were the keys in industrial device fabrication and also led to success in InGaN LEDs and InGaN lasers. Such techniques, protected by patents, are being broadly applied by industries now. Further progress in QDs allows developing of further novel approaches for QD fabrication and continuous improvement in the performance of QD-related devices.

Biography

Nikolay Ledentsov completed his Graduation at Electrical Engineering Institute in Leningrad (LETI) in 1982. He completed his Cand Sci and DSci Degrees in Physics and Mathematics at Ioffe Institute, Russia in 1987 and 1994, respectively. He has been a Professor at LETI since 1994, at Ioffe Institute since 2005 and at TU Berlin (1998-2007). His main interests are in the field of "Physics and technology of semiconductor nanostructures and the related devices". He has Co-authored 800 papers and 30 patent families. He is a member of Russian Academy of Sciences, senior member of IEEE and Fellow of Institute of Physics. He received Young Scientist Award of International Symposium on Compound Semiconductors for pioneering contributions to the field of quantum dots and quantum dot lasers.

nikolay.ledentsov@v-i-systems.com

Notes: