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Recent progress in III-V and II-VI semiconductor nanostructures for mid-infrared optoelectronics

According to conventional wisdom, in regards to optoelectronics, III-V semiconductor materials prevail over their II-VI counterparts due to stronger chemical bonds and more advanced fabrication technology of the former. Ever increasing demand in various types of optical sensors, especially these operating in the infrared part of the spectrum, where they are employed for controlling environment and manufacturing processes, as well as in medical devices, strongly challenges current technology and requires more efficient light sources and photodetectors. In this talk, I will review recent progress in mid-infrared (2-6 μm wavelength range) optoelectronics in regards to competing III-V and II-VI materials and nanostructures. In particular, prospects of II-VI-based light emitters will be considered in view of the latest results achieved with the use of molecular beam epitaxy-grown (Hg and Cd) Te nanostructures, where engineering of compositional fluctuations in the alloy seems to advance the emitting properties of these well-known materials to a new level. Concerning III-V materials, I will consider the results of the latest experiments showing the effects of specific non-radiative recombination processes on the properties of narrow-bandgap light emitters, and discuss the prospects that proper optical confinement promises in terms of increasing the efficacy of such devices. Recent experimental findings will be compared to the results of specified calculations of recombination rates in the materials in question.

Biography

Karim D Mynbaev has received his MSc in Optical-Electronic Systems from St. Petersburg Electro-technical University "LETI" in 1986, and his PhD and DSci degrees in Semiconductor Physics from Ioffe Institute in 1992 and 2007, respectively. His research interests mostly concern narrow-bandgap semiconductors and optoelectronic devices designed to operate in the mid-infrared (2-6 μm wavelength range) part of the spectrum, based on II-VI (Hg,Cd)Te and III-V (InAs(Sb,P)) systems. He is also involved in the studies of defect structure of wide-bandgap materials, such as SiC and GaN. He has authored and co-authored more than 100 papers in international peer-reviewed scientific journals and 2 book chapters. Currently, he heads the Laboratory of Photoelectrical Phenomena in Semiconductors at Ioffe Institute, and serves as a Professor at the Chair of Light Technologies and Optoelectronics at ITMO University.

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