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Recent advances of III-V semiconductor quantum devices from deep UV (200 nm) to THZ (300 microns)

Nature offers us different kinds of atoms. But it takes human intelligence to put different atoms together in an elegant way in order to realize manmade structures that is lacking in nature. This is especially true in III-V semiconductor material systems. Guided by highly accurate atomic band structure simulation, modern semiconductor optoelectronic devices are literally made atom by atom using advanced growth technology such as Molecular Beam Epitaxy (MBE) and Metal Organic Chemical Vapor Deposition (MOCVD). Recent breakthroughs have brought such quantum engineering to an unprecedented level, covering an extremely wide spectral range from 200 nm to 300 μm. On the short wavelength side of the electromagnetic spectrum, we have demonstrated III-nitride light emitting diode emitting in deep ultraviolet to visible. In the infrared, quantum cascade lasers (QCLs), and focal plane arrays (FPAs) based on quantum-dot (QD) or type-II super lattice (T2SL) are becoming the choice of technology in crucial applications such as environmental monitoring and space exploration. Last but not the least, on the far-infrared side of the electromagnetic spectrum, also known as the terahertz (THz) region, III-V semiconductor offers a unique solution of generating THz waves in a compact device at room temperature. Continuous effort is being devoted to all of the above mentioned areas with the intention to develop smart technologies that meets the current challenges in environment, health, security, and energy. In this talk, the latest advances in III-V semiconductor optoelectronic devices at the Center for Quantum Devices, Northwestern University, will be presented.

Biography

Manijeh Razeghi joined Northwestern University, Evanston, IL, as a Walter P. Murphy Professor and Director of the Center for Quantum Devices in fall 1991, where she created the undergraduate and graduate program in solid-state engineering. She is one of the leading scientists in the field of semiconductor science and technology, pioneering in the development and implementation of major modern epitaxial techniques. Her current research interest is in nanoscale optoelectronic quantum devices. She has authored or coauthored more than 1000 papers, more than 30 book chapters, and 16 books. She holds 30 US patents and has given more than 1000 invited and plenary talks. She received the IBM Europe Science and Technology Prize in 1987, the Achievement Award from the SWE in 1995, the R.F. Bunshah Award in 2004 and many best paper awards. She is an elected fellow of SWE (1995), SPIE (2000), IEC (2003), OSA (2004), APS (2004), IOP (2005), IEEE (2005) and MRS (2008).

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