MAR10-2009-001218

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

Silicon-Germanium Nanostructures for Light Emitters and On-Chip Optical Interconnects

LEONID TSYBESKOV, New Jersey Institute of Technology

The basic elements of the modern Si photonic system are photodetectors, waveguides, modulators and light-emitters. In order to be commercially valuable, the light emitters should be efficient, fast, operational at room temperature and, perhaps most importantly, be compatible with the "main stream" CMOS technology. Another important requirement is in the emission wavelength, which should match the optical waveguide low-loss spectral region, i.e., 1.3-1.6 μm. Among other approaches, epitaxially-grown Si/SiGe quantum wells and quantum dot/quantum well complexes produce efficient photoluminescence (PL) and electroluminescence (EL) in the required spectral range. Until recently, the major roadblocks for practical applications of these devices were strong thermal quenching of the luminescence quantum efficiency and a long carrier radiative lifetime. In this presentation, the latest progress in the understanding of physics of carrier recombination in Si/SiGe nanostructures is reviewed, and a route toward CMOS compatible light emitters for on-chip optical interconnects is proposed.