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Design of a novel heterostructure photodetectors with dramatically enhanced signal-to-noise based on resonant interface-phonon-assisted transitions and engineering of energy states to enhance transition rates

Michael A Stroscio, Yi Lan, Nanzhu Zhang, Lucy Shi and **Mitra Dutta**
University of Illinois at Chicago, USA

A novel hetero structure photo detector design is presented that facilitates dramatic enhancements of signal-to-noise. The structure incorporates a single quantum well coupled to a symmetric double quantum well that makes it possible to engineer energy states with energy state separations equal to interface phonon energy. In addition, quantum level energy degeneracy between states in the single-well and double-well systems makes it possible to enhance the rate of interface-phonon-assisted transitions. Together, these effects make it possible to greatly enhance signal-to-noise ratios in these heterostructure-based photodetectors. These designs are optimized based on Schrödinger equation calculations of the energy states and the determination of interface phonon potentials and dispersion modes by applying boundary conditions for which the phonon potential has corresponding continuous normal components of the displacement field and tangential components of electric fields. Novel photodetector designs with dramatically enhanced signal-to-noise will be presented for a number of different heterostructure devices.

Biography

Michael A Stroscio (FIEEE, FAPS, FAAAS), the lead speaker, is a UIC Distinguished Professor and Richard and Loan Hill Professor. He has authored about 800 papers, books, book chapters, proceedings, patents and presentations, with about 350 of these contributions being refereed papers. He holds a PhD from Yale University.

stroscio@uic.edu