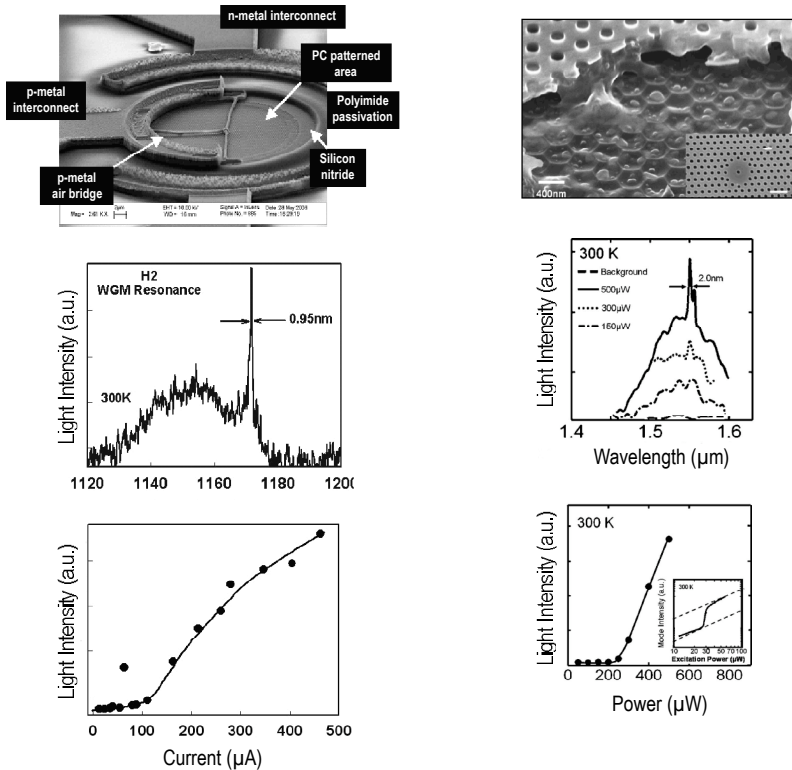


Quantum Dot Photonics Crystal Microcavity Light Emitter

Swapnajit Chakravarty, Zhuang Wu, and Pallab Bhattacharya



InGaAs QD PhC light emitter: SEM image (top), spectrum (center), and light-current (bottom).

PbSe QD PhC light emitter: SEM image (top), spectra (center), and light-light (bottom).

Two-dimensional photonic crystals (PhC) can provide a universal platform for nanocavity optical resonators and low-loss waveguides with unique dispersive properties. The small modal volume, high-quality factor PC microcavities modify the density of states so that photons, due to enhancement of spontaneous emission rate, are preferentially emitted into microcavity resonant modes. We have successfully demonstrated photonic crystal light sources using electrical injection which exhibit coherent emission with sub-nanometer linewidths. We have also demonstrated significant cavity coupling and enhancement of spontaneous emission (Purcell effect) at $1.55\mu\text{m}$ from PbSe colloidal quantum dots in a silicon, photonic, crystal microcavity at room temperature by optical pumping. This project is being supported by Air Force Office of Scientific Research under award number FA 9550-06-1-0500 and Defense Advanced Research Projects Agency under award number HR 0011-04-1-0040.