Fine Structure Splitting in QDs
Crystal Symmetry, Strain, and Piezo-Electricity

Objective:

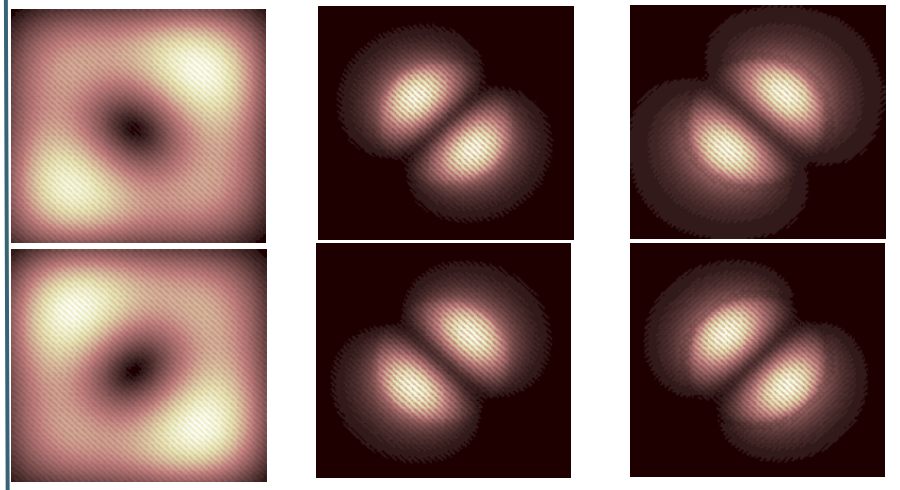
- Understand experimental data on QD spectra fine structure
- Px and Py states are split in energy – Why – critical physical items ?

Approach:

- Implement piezoelectric charges through electrostatic potential
- Compare effects of
  - Crystal symmetry
  - Strain
  - Piezoelectricity
- Disk shaped dots d=10nm, h=2.5 nm, 10nm cap, 20nm substr., 0.6nm WL

Impact:

- Demonstrated quantitative agreement with experiment
- Atomistic approach is essential



no strain | with strain | w/ strain&piezo

Result:

- Disk shaped dots d=10nm, h=2.5 nm, 10nm cap, 20nm substr., 0.6nm WL
- Crystal symmetry alone breaks symmetry of set of first excited states (weak)
  => effective mass, k.p fail!
- Strain breaks symmetry stronger
- Piezoelectric effect opposes strain
  => can flip orientation of the excited states