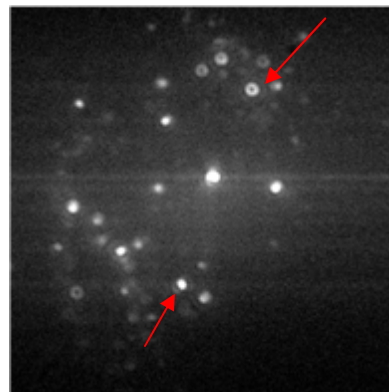


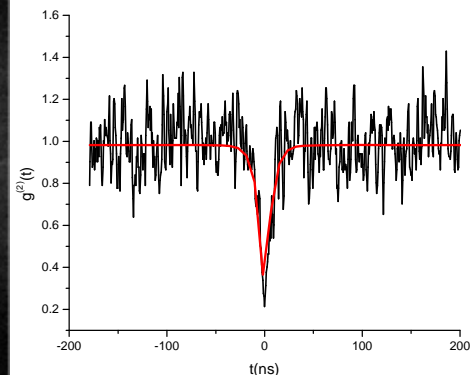
Optical Anisotropy Of Indium Phosphide Semiconductor Quantum Dots

We have observed highly anisotropic optical emission from InP quantum dots on a glass substrate.

- ❖ For cubic semiconductor crystals grown from solution, the existence of a preferred direction for optical absorption or emission is not expected.
- ❖ InP particles of 2-3 nm diameter were sprayed from solution at low concentration onto a glass coverslip and illuminated using a total internal reflection geometry.
- ❖ Images of the optical emission pattern are similar to the radiofrequency intensity pattern generated by a radio antenna.
 - ◆ zero intensity radiated parallel to the direction of the dipole, giving a donut-shaped pattern if the optical dipole is vertical
 - ◆ elliptical pattern if the dipole is horizontal
- ❖ Most of the particles appeared to be oriented either perpendicular or parallel to the glass substrate (shown by red arrows in the image).



Emission Image



Photon Anti-bunching Data

- ❖ A possible explanation is that the particles are not single quantum dots, but aggregates of more than one.
 - ❖ Photon correlation measurements (anti-bunching) proved that the particles are single quantum states.
 - ❖ Particles with either orientation were observed to blink on and off periodically.
 - ❖ We have recorded spectra of individual emitters of both types that display multi-lobed maxima in the vicinity of 640 nm.
- Our collaborators in this work are Kin C. Ng (CA State-Fresno) and Tingying Zeng (University of Western Kentucky).