Colloidal Quantum Dots for Short-Wave Infrared Photon Sensing
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What are Colloidal Quantum Dot Particles?

Emerging Technology

Nano sized semiconductor particles

Solution-processed

Quantum and electrical properties size-tunable
Why Infrared?

Silicon: 400-1100nm

Gallium Arsenide: 800-2000nm

Solution-Processed Colloidal Quantum Dots
More Details on Colloidal Quantum Dots
Goals

To synthesize 1 eV nanoparticles

- Peak at 1240nm
- Peak to Valley Ratio at least 2.0
Methods

Results
Results

- 1288 nm CQDs with peak to valley ratio of 1.5
- 964 nm CQDs with peak to valley ratio of 3.36
Results

1128 nm CQDs with peak to valley ratio of 2.07
Photodetectors and Optoelectronics

Plasmonics
Silica-Gold Core-Shell Nanoparticles

![Diagram of Silica-Gold Core-Shell Nanoparticles]

- **SiO$_2$ Core** (Diameter 60 nm)
- **Gold Shell** (Thickness 20 nm)
- **SiO$_2$ Core** (Diameter 60 nm)
- **Gold Shell** (Thickness 5 nm)

**Extinction (Arb. Units)**

**Wavelength (nm)**

- 20 nm
- 10 nm
- 7 nm
- 5 nm

![Graph of Extinction vs. Wavelength]
Discussion

Photodetectors can be used in:

- Imaging devices such as MRI scanners, X-rays, satellite imaging equipment
- Energy harvesting devices such as solar cells and solar panels
- Other electronic devices that make use of photodetectors such as fibre-optic cables, spectrophotometers,
Thank You!
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