

# Physics and chemistry of nanostructures

Progress Navolchi project

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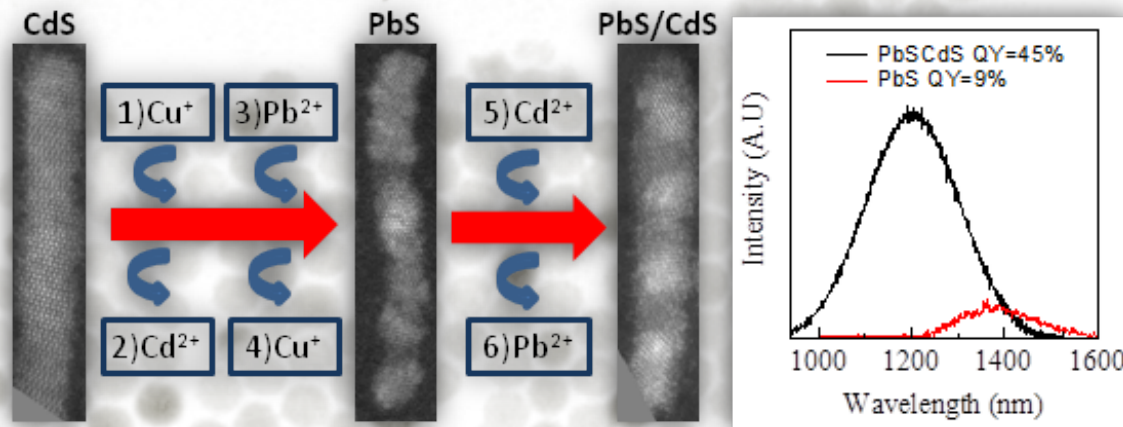
# Outline

- **Materials**
  - PbS rods and PbS/CdS heterostructures
  - PbSe/CdSe heterostructures
- **Processing**
  - Thin films of PbS QDs by LBL-assembly
  - Local deposition of QDs
- **Properties**
  - Intraband absorption with PbX QDs
- **Planning of future work**



# Materials

## PbS/CdS multiple dot-in-rods

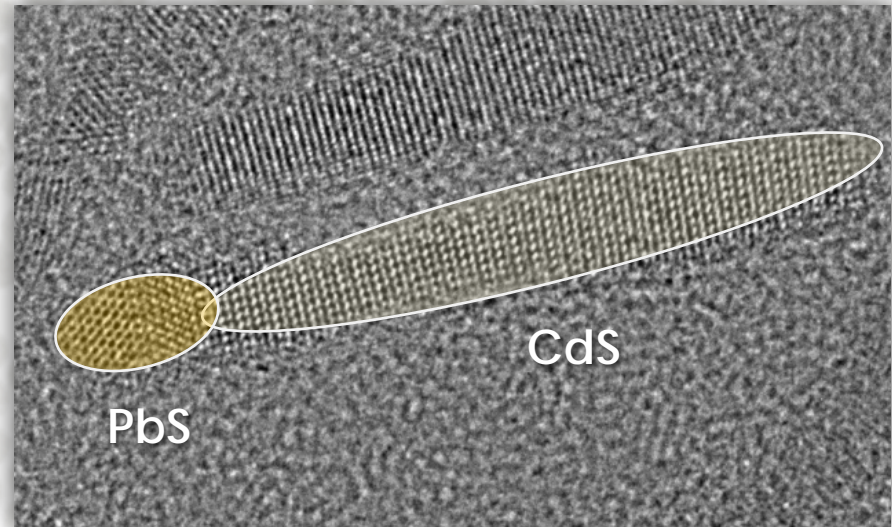
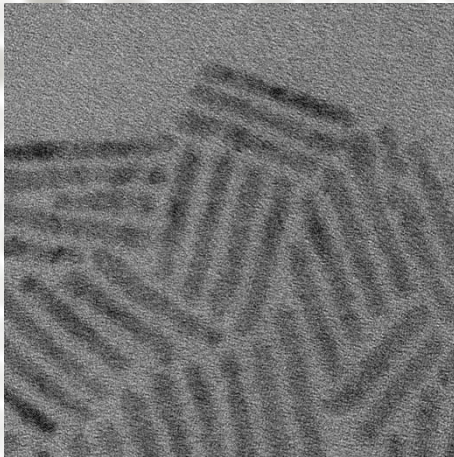
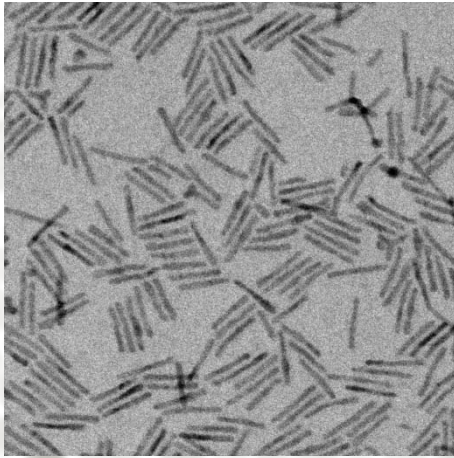


- Successive cation exchange steps transform original CdS rod into a PbS/CdS multiple dot-in-rod
- Passivation by CdS enhances PLQY to 45-55%

Justo *et al.*, revised version for JACS under preparation

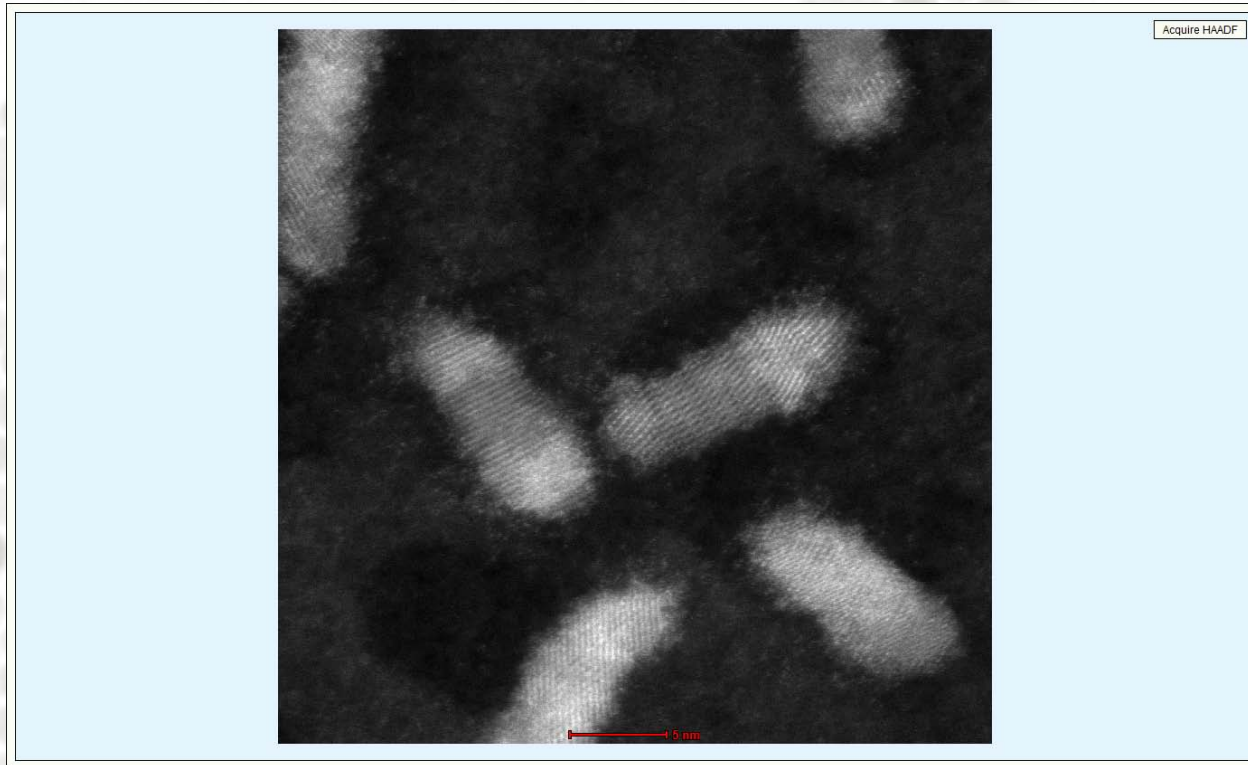
# Materials

## PbS/CdS dot-in-rods



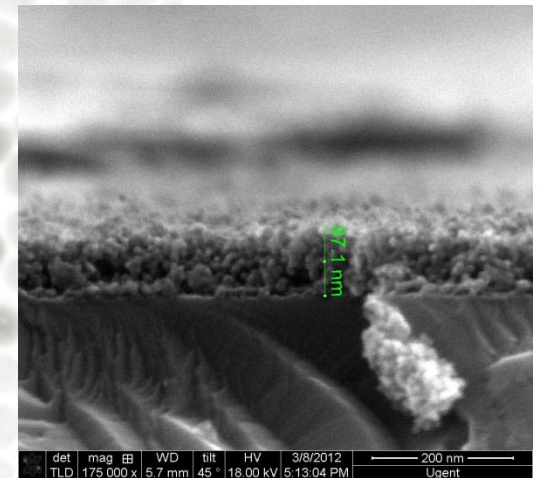
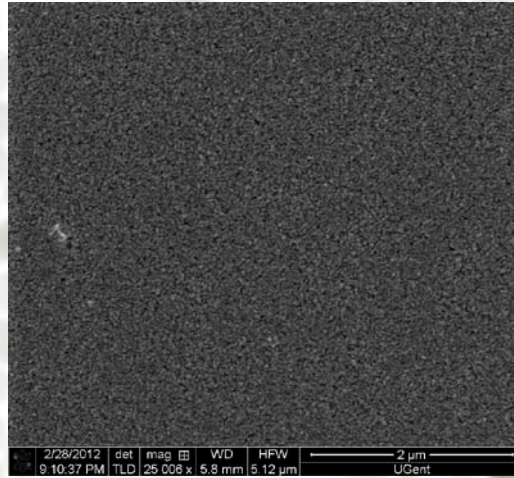
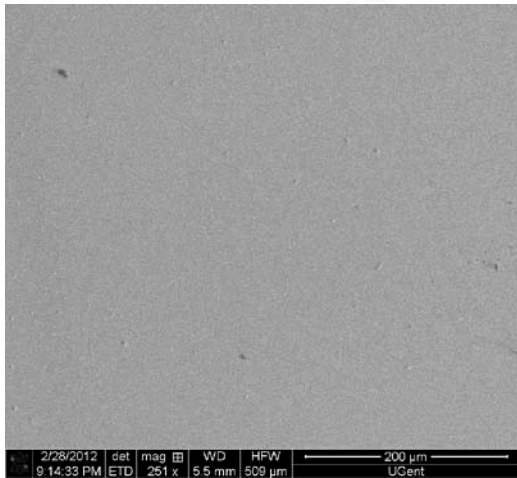
# Materials

## PbSe/CdSe dots-in-rod



# Processing

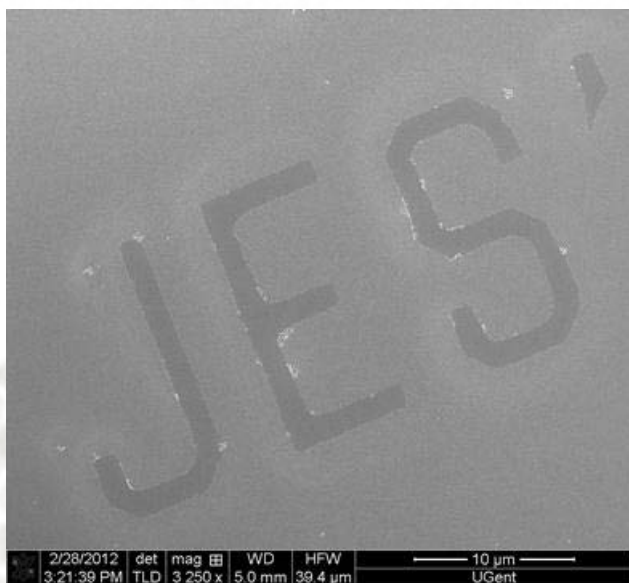
## PbS QD thin films by layer-by-layer assembly



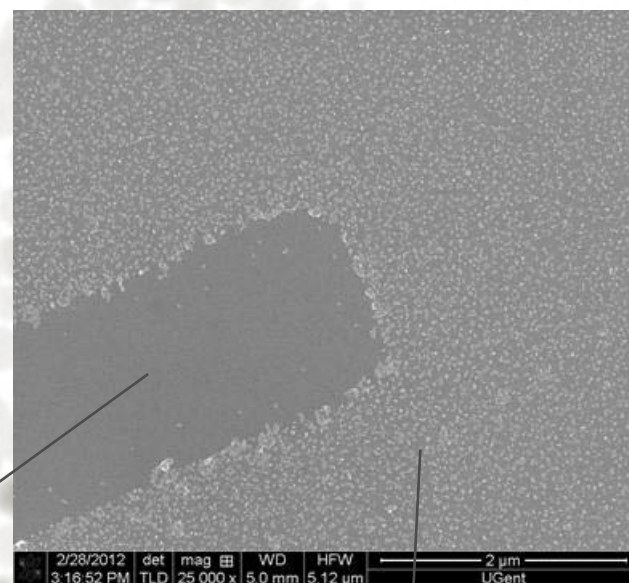
- Made by repetitive dip coating & ligand exchange
- Large area uniform films, interparticle spacing  $< 0.5$  nm

# Processing

## Local deposition of QDs by surface pretreatment



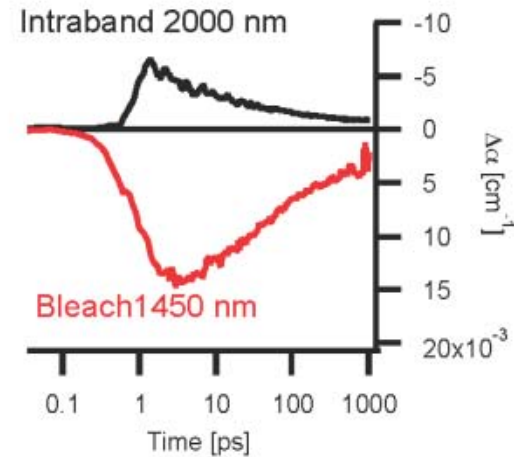
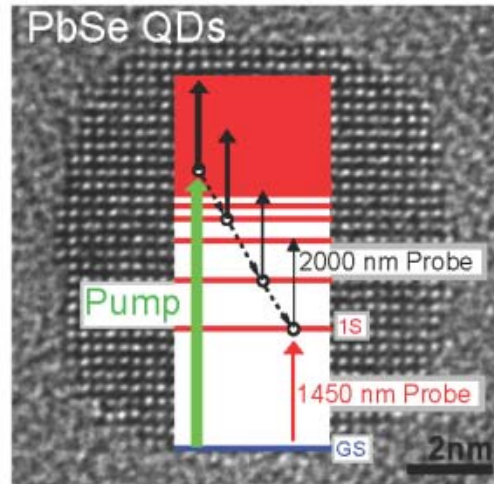
Region treated by  
anti-adhesion coating



Submonolayer of quantum dots

# Properties

## Intraband absorption in excited QDs



De Geyter et al., submitted to Nano Letters (March 5<sup>th</sup>)



# Future work

- **Transient absorption spectroscopy (amplification) on PbS rods and heterostructures foreseen end of March**
- **First photodetection studies on PbS layers scheduled by April**
- **Sample exchange with Valencia?**

