

Fabrication of Light-Emitting Devices Using Polyelectrolyte Films



Govinda Escobar
Mentee

Asanga Ranasinghe
Mentor

Prof. Steven Buratto
Faculty Advisor

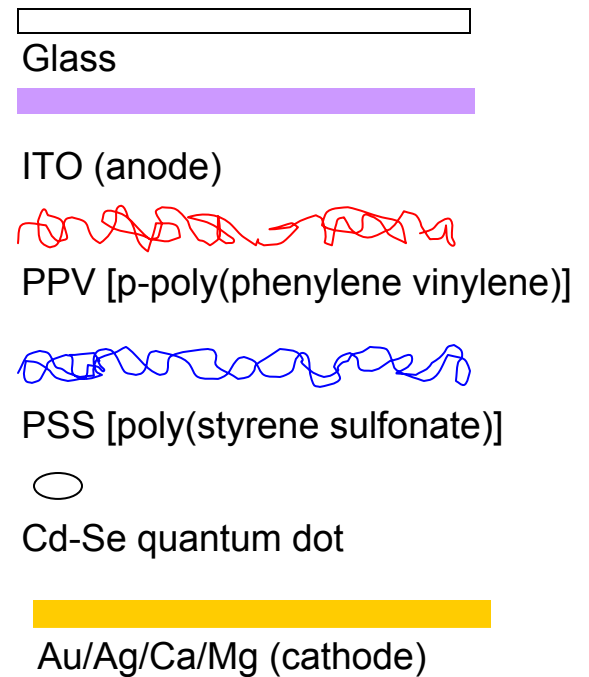
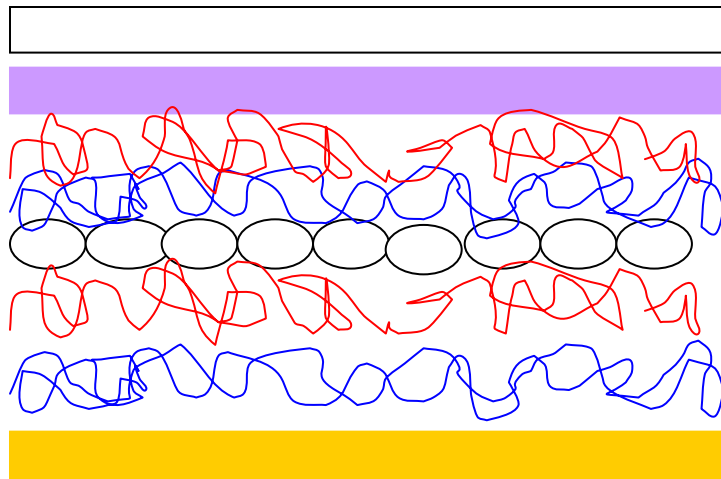
Funding Provided By
MC-CAM



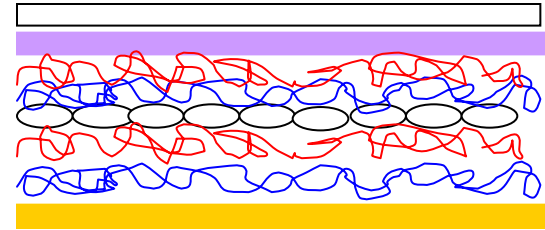
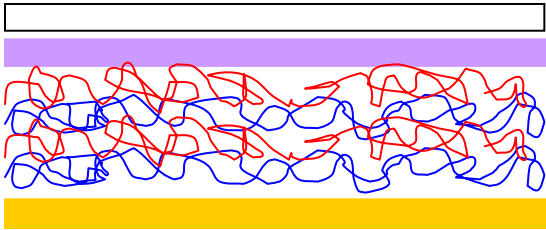
Objectives of Research:

- To fabricate light-emitting devices using different polyelectrolyte films, Cd-Se quantum dots, and cathodes
- To study electroluminescent (EL) efficiencies

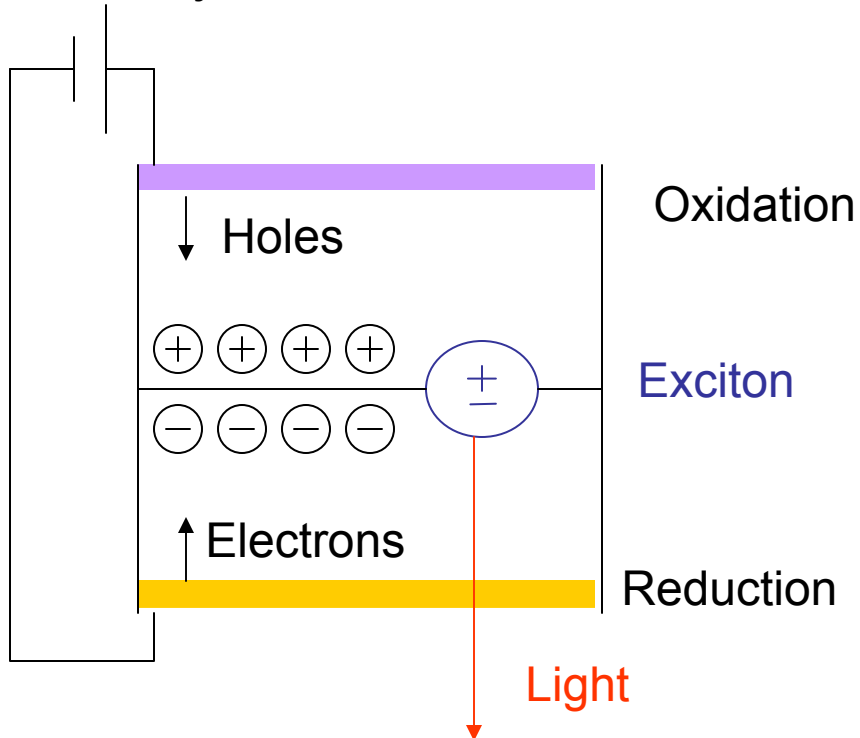
Structure of Device



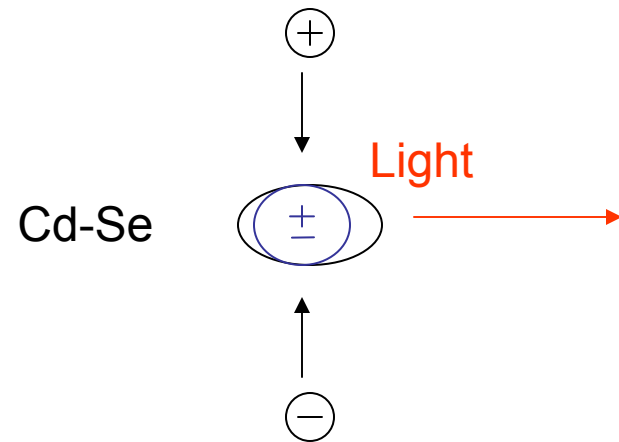
Organic Electroluminescence



➤ Exciton formation at the organic heterojunction

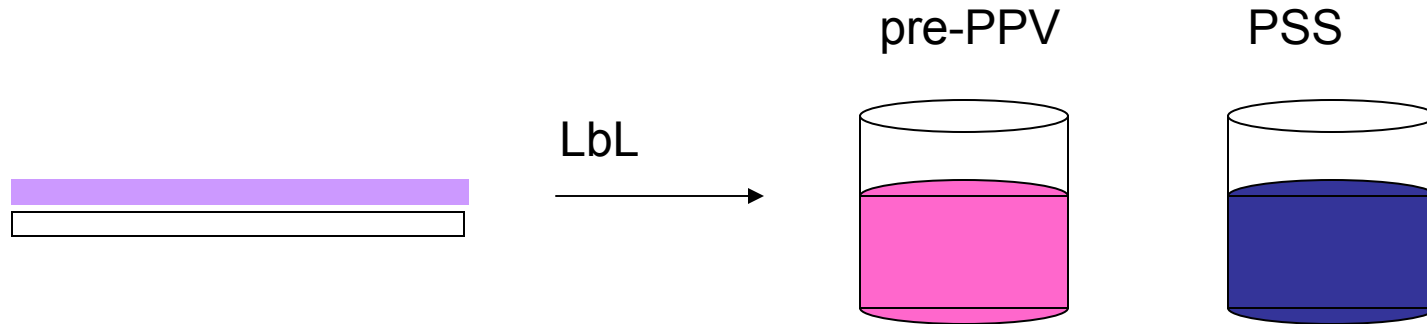



➤ Exciton formation on the quantum dot layer



Deposition of Polyelectrolyte Films

➤ Layer-by-Layer self-assembly



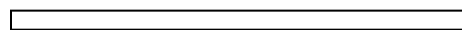

PSS [poly(styrene sulfonate)]



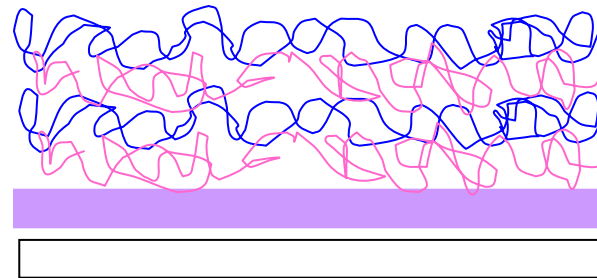
pre-PPV [poly(p-xylene tetrahydrothiophenium chloride)]



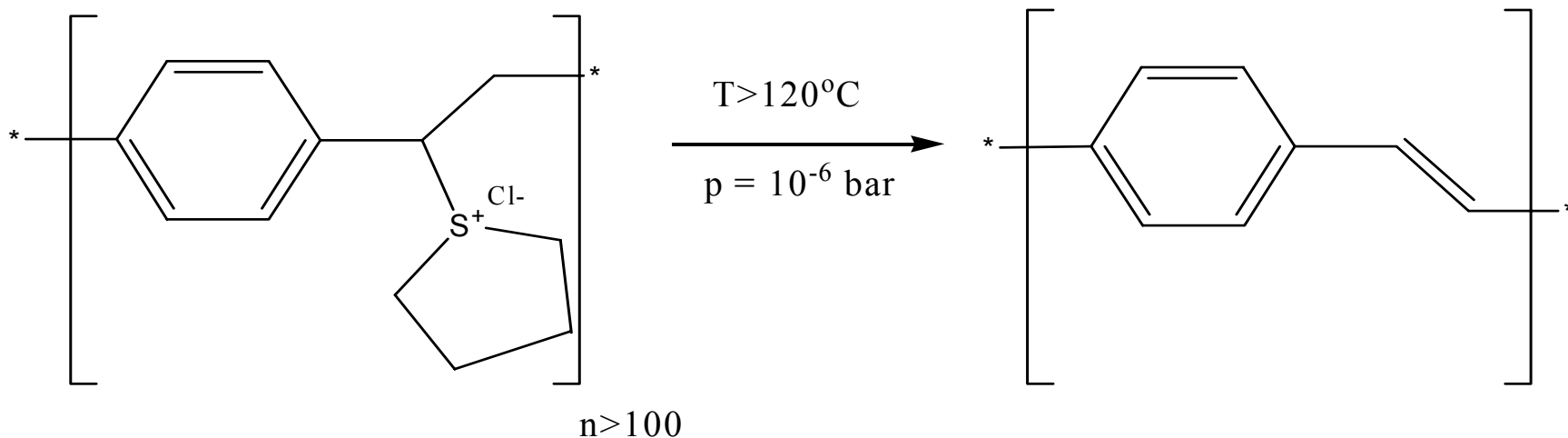
ITO (anode)



Glass

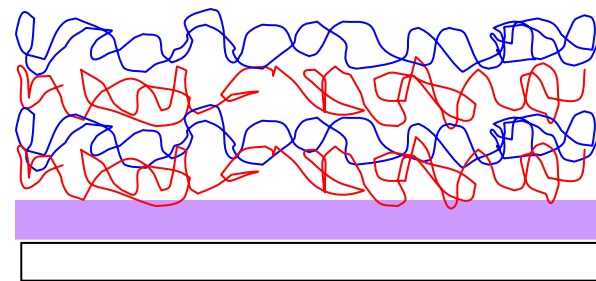
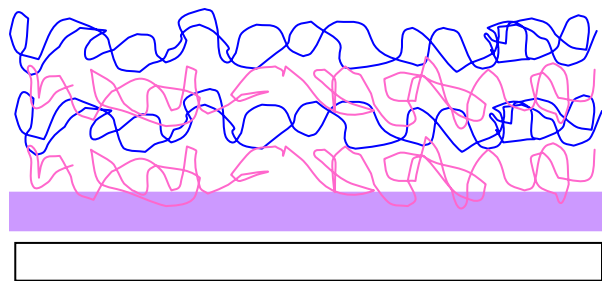


Conversion of pre-PPV to PPV



Pre-PPV

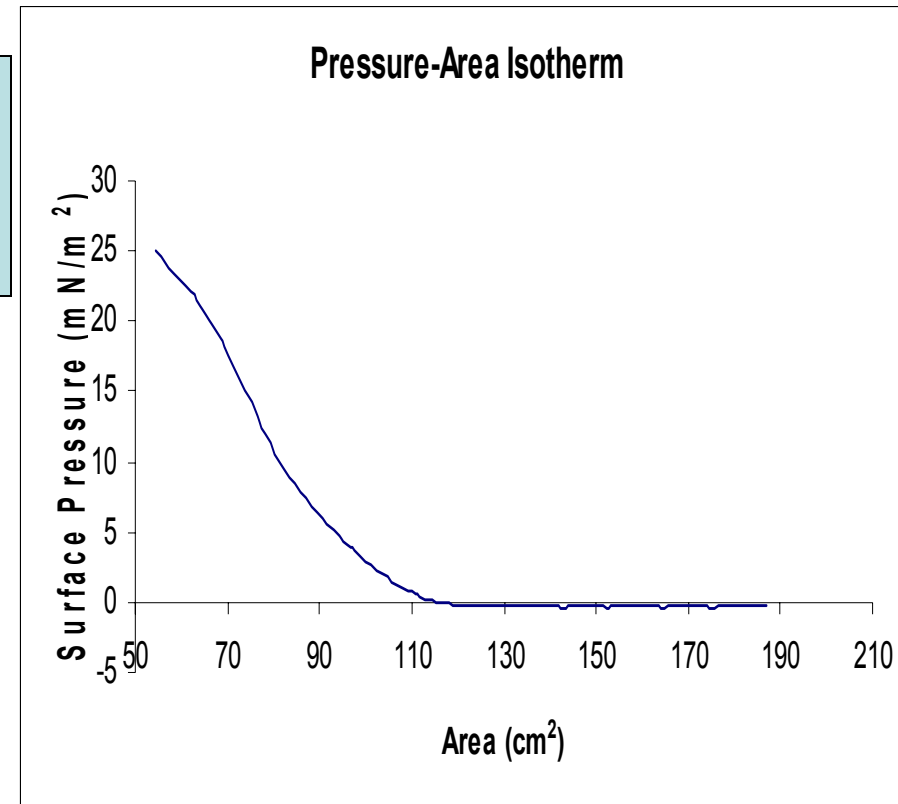
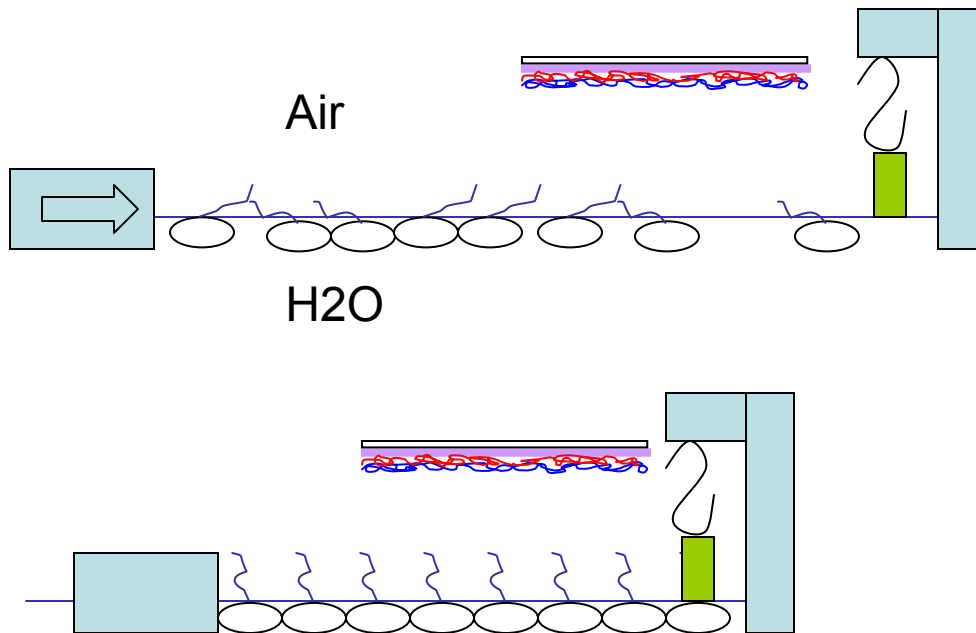
PPV



Deposition of Cd-Se Quantum Dots

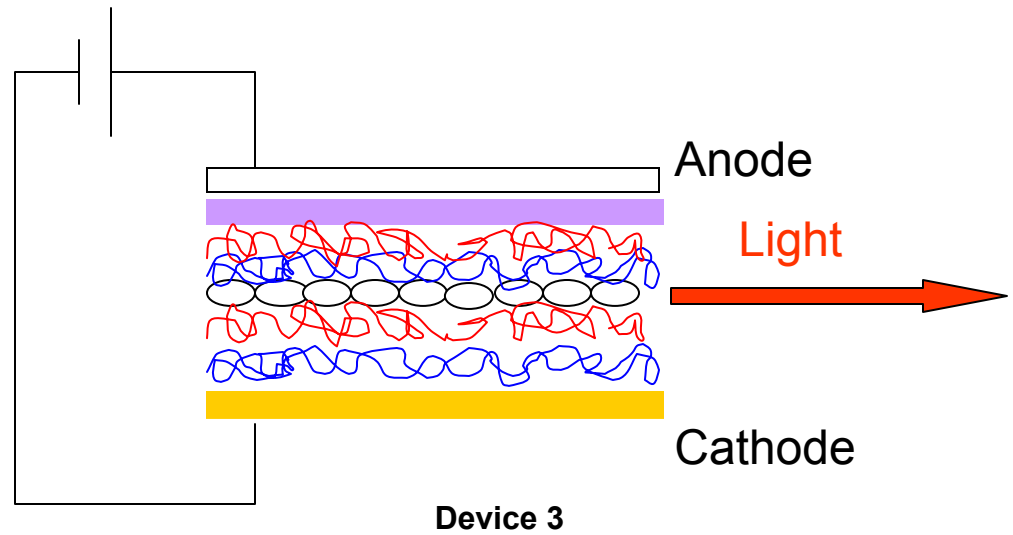
The Langmuir-Blodgett trough

- Surface pressure for deposition is 30-35 mN/m²
- Langmuir-Schafer deposition technique used to deposit CdSe quantum dots



Studying Electroluminescence

- Current Density versus voltage is investigated
- Brightness versus voltage is investigated

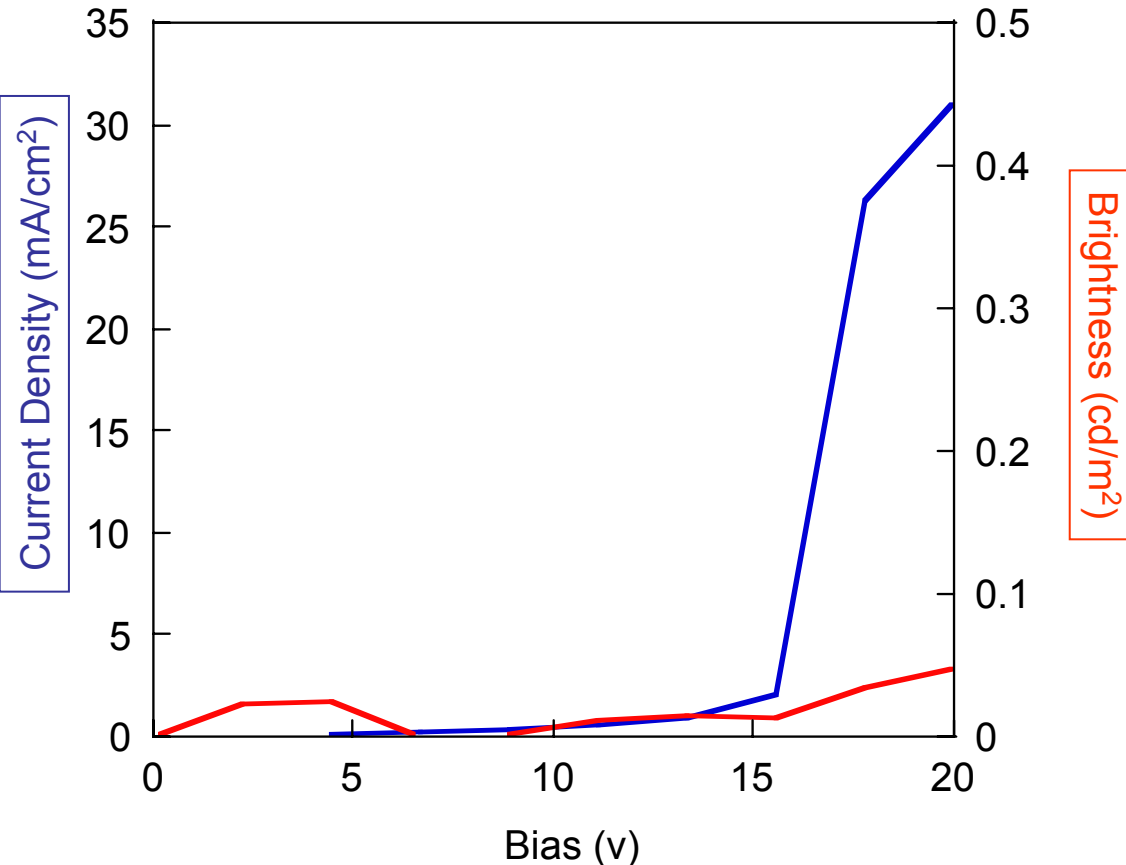


No electroluminescence observed:

- Oxidation of quantum dots with time
- Dust particles caused a short circuit

Modifications:

- ZnS coating on quantum dots
- Dust free environment



Feature Plans for Research:

- To optimize the conditions for the fabrication of light-emitting devices

My Accomplishments and Plans:

- Realized my potential as a researcher
- To return next summer as an intern in the same research group
- To obtain a PhD in physics

Acknowledgements:

- MC-CAM
- INSET
- Prof. Steven Buratto
- Asanga Ranasinghe
- Buratto Research Group
- Dr. James Kosmicki
- My Family