Martí Gibert Roca Thesis Outline:

1. Introduction
   1. Why Solar?
   2. Photovoltaics
      1. Materials
      2. Characterization (15)
   3. Organic Photovoltaics
      1. Working Principle
      2. Device Architecture
      3. Photoactive Layer (16)
      4. State Of the Art
   4. This Work
      1. Motivation
      2. Structure
2. Materials and Methods
   1. Organic Solar Cell Fabrication
      1. Materials
      2. Cleaning
      3. Dr Blade Deposition
      4. Spin Coating Deposition
      5. Thermal Evaporation
      6. Encapsulation
      7. Annealing
   2. Nanoimprinting Soft Lithography
      1. Thermal nanoimprinting lithography
      2. Solvent Assisted Nanoimprinting Lithography
      3. Stamp Architectures and Replication
      4. Stamp Feature Depth
   3. Device Characterization
      1. Electrical Characterization
         1. JV Curves (17)
         2. EQE Curves
         3. LBIC
         4. Time Dependant Measurements
      2. Optical Characterization
         1. FTIR Spectra
         2. Integrating Sphere Spectra
         3. Raman Spectra
      3. Topological characterization methods
         1. Scanning electron microscopy (SEM)
         2. Profilometry
3. Automation in OPV Characterization
   1. Pika Demultiplexer
      1. Concept
      2. Circuit Design and 3D printing
      3. Software and operation
   2. EQE Measuring Setup
      1. Concept and Components
      2. XZ Stage
      3. Filter Flipper
      4. Software and operation
         1. Developed Libraries
         2. Main Software
4. Photonics on Organic Solar Cells and Organic Photodetectors
   1. Hypothesis
   2. Photonics in Photovoltaics; State of the Art
   3. Nanostructured Solar Cells
      1. Materials(1)
      2. Performance
   4. Nanostructured Photodetectors
      1. Materials
      2. Nanostructure Optimization (4,5,8,10,13)
      3. Simulations
      4. Active layer Thickness (12)
      5. Annealing (9,11)
   5. Optical and Structural Characterization (2,6,7)
      1. FTIR Spectra
      2. SEM Images
   6. Electrical Characterization
      1. EQE Curves
      2. EQE With Applied Voltage
      3. Responsivity
      4. Dark Current
      5. Light Dynamic Range
      6. Enhancement factor
      7. Time Response (14)
      8. On Off Ratio (13)
      9. NIR Eye
         1. LBIC at Different wavelengths
5. Organic solar cells and heat
   1. Hypothesis
   2. Heat and Photovoltaics; State of the Art
   3. Hot n Cold Setup
      1. Concept and Construction
         1. PLA Salt Annealing
      2. Circuit Design
      3. Software and Operation
   4. Organic Photovoltaics and Heat
      1. Photoactive Materials Study
      2. Other Results (Light Intensity Performance, Mobility, Structural Changes (GWAX GISAX))
   5. Heat Harvesting Strategies
      1. Electrode Photonic Structures
      2. Lossy Metallic Structures
6. Rainbow Solar Cells
   1. Hypothesis
   2. Spectral Splitting in Photovoltaics; State of the Art
   3. Python Simulations
      1. Introduction
      2. Top Hat EQE Generation
      3. Shifting Top Hat EQE Curves
      4. Widening Top Hat EQE Curves
      5. Real EQE Curves Comparison
      6. Real and Simulated EQE Curve Matching
   4. Different Materials study
      1. Material Matching
   5. Manufacturing
      1. Lateral Deposition
         1. Blade Design and construction
      2. Gate assisted deposition
      3. Laser Electrode Cutting
   6. Rainbow Characterization
      1. Setup Overview
      2. Measurement Routine
      3. Red and Blue Sweeps
   7. Cavity devices
   8. Active Layer Thickness Study
7. Conclusions
   1. Photonics on OPV
   2. Heat on OPV
   3. Unicorns and Rainbows
8. Experimental Setups
   1. Cell Manufacturing Optimization
      1. ITO Custom Etching
         1. Etching Masks and Procedure
      2. Cell cleaning
         1. Cell specific cleaning trays and vases
         2. Cell specific drying procedure
      3. Cell deposition
         1. Contact Cleaning
      4. Cell Evaporation
         1. Custom Masks
         2. Cell Evaporation Magnetic Holder
         3. Boat Organizer
      5. Cell Encapsulation
   2. Rainbow Setup
      1. Concept and Construction
      2. Concave Mirror
      3. LCD
      4. Software and operation
         1. Developed libraries
         2. Main Software
   3. Gail’s Finger
      1. Principle of operation
      2. Capacitive detection
      3. LCD menu controls
   4. Arduino Laser Shutter
   5. Robotic Arm for Spray coating

Interesting Graphs:

1. 8EFG

2. 8FP P3HT Reflections

3. Simus p3Ht patterns

4. 8HGHG Treated

5. GIFinalo (EQE really good, and MoO3 dependance)

6. 8K5F PBTTT

7. 9CB P3HT PBTTT Photodetectors

8. Dark Current measurements (fer mitjana de les corves, per diferents AL thicknesses I diferents MoO3)

9. MGR.190228.9BP\_03012

10. 8FPC Photodetectors with voltage

11. 9CB P3HT PBTTT Photodetectors different thicknesses (might not be that useful)

12. MGR.190506.9DT

13. MGR.190517.9DT

14. 9DTETime resolved measurements

15. IV, EQE, LBIC, Reflectance, I alguna més que se t’acudeixi

16. Ficar tant Bulk heterojunction com els diferents materials de la photoactive layer

17. Both light and dark current