Inorganic-organic hybrid solar cells show promise over traditional silicon-based cells due to ease of production and low cost. It is beneficial to analyze potential solar cell electrode materials and deposition processes. Inkjet-based material printing can reduce costs, waste, and energy inputs. It is known that aluminum evaporation can provide a functioning cell, but little work has been done on printed silver. Solar cell efficiencies were compared between samples with printed silver electrodes and aluminum evaporated electrodes to determine if silver is a viable alternative to aluminum.

**Solar Cell Assembly**
- Indium Tin Oxide (ITO) acts as the bottom electrode.
- PEDOT:PSS is a combination of ionomers that increases adhesion and acts as an electron blocking layer.
- P3HT:PCBM is the active layer of the cell. Light excites the material forming an electron-hole pair called an "exciton".
- P3HT:TiO2 is an alternative active layer. A TiO2 hole blocking layer (HBL) is required when making this type of cell.
- Top electrode is made of either silver or aluminum.

**Methods**
- ITO glass obtained from Taiwan University. Glass cut into 7 mm x 20 mm samples with 5 mm ITO strip.
- Spincoat 150 µL of PEDOT:PSS onto the sample at 5000 rpm for 60 seconds. Samples annealed at 125 °C for 10 minutes.
- Silver electrodes printed with the Dimatix printer then annealed in a vacuum chamber at 140 °C.
- Aluminum electrodes flash evaporated in a vacuum then annealed at 140 °C.
- Illumination testing using the Orion xenon-based sunlight simulator at 100mW/cm².

**Results**
- Comparison of average solar cell efficiencies are shown below for different electrode types on P3HT:PCBM.
- Solar cell functionality is lost despite having a continuous electrode for printed silver on TiO2.

**Electrode Deposition**
- Aluminum was deposited onto the P3HT:PCBM active layer via flash evaporation. Evaporation requires a vacuum and high temperatures.
- Material printers utilize silver inks to deposit electrodes with low energy inputs and short process duration.
- Silver forms discontinuous "islands" when printed onto the P3HT:PCBM. Sequential print passes form larger islands, but yield little increase in continuity.
- Silver printed onto P3HT:TiO2 with a TiO2 HBL layer yields a reflective smooth uniform film.