



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Anshul Narain	Project Number S0615
Project Title Developing Metal Electrodes to Replace ITO in Organic Thin Film Solar Photovoltaics	
<p style="text-align: center;">Abstract</p> <p>Objectives Develop a method to effectively replace Indium Tin Oxide (ITO) anodes with inexpensive Silver (Ag) anodes in thin film solar cells.</p> <p>Methods Used spin-coater to deposit polymer films on substrate. Measured % transmittance with a UV/Vis spectrometer. Used thermal evaporator to deposit metal anodes and cathodes in to devices. Measured current density vs. voltage with Keithley JV curve measurer. Analyzed data in MATLAB.</p> <p>Results With the conditions determined through the preliminary testing, the Silver anodes were able to effectively replace the ITO anodes in thin film solar photovoltaics by allowing the devices to function as diodes and abide by the predictions of the Child Langmuir Law. Similar charge mobility in devices developed with ITO and the devices I developed with Silver indicate comparable efficiencies as well.</p> <p>Conclusions The Silver anodes allowed for the devices developed to function effectively without the use of ITO. This means that Silver can be used as a viable alternative to ITO while reducing the cost by almost 13 times per unit mass.</p>	
Summary Statement I developed a method by which expensive Indium Tin Oxide anodes could be effectively replaced with inexpensive Silver anodes in organic thin film solar photovoltaics.	
Help Received I designed the method for replacing ITO with Silver myself with guidance from my lab mentor. My mentor also reviewed the validity of my procedures and results.	