To study the charge transport properties and physical variables affecting the performance of polymer solar cells

**BACKGROUND**
- The formation to fuse D/A networks increases the charge transfer and permits the efficient transport of the produced charges to their corresponding electrodes.
- The researchers can enhance the stability of the OSCs by making use of the higher mobility polymers.
- The OT is a crucial factor for photovoltaic conversion efficiency of the OSCs.
- Very few efforts have been made for an organic solar cell to give its maximum output.
- Power efficiency of a PV cell are associated with the physical variables such as operational temperature etc.

**OBJECTIVE**
The undergraduate students will learn a bit reflective understanding about the charge transport physics of the organic semiconductors and organic photovoltaic. Also, they will get a chance to do fabrication and measurements procedure, practically measure the varied physical parameters and will learn to use specific equipment and instrumentations in the fields of solar energy.

**METHOD**

**SUBSTRATE CLEANING AND PREPARATION**
- The ITO coated glass substrates washed in water and submerged in acetone and methyl alcohol.
- In substrate: cleaning process slides were dried with hot air blow dryer.
- The process repeated several times to verify that substrates were completely cleaned in acetone and rotated for 15 minutes.

**SOLUTION PREPARATION AND THIN FILM FORMATION**
- We performed on (PCPDTB) and (PC71BM).
- PCl3 and BTrz films using spin coating. These solutions were prepared individually in chlorobenzene by dissolving 10 mg of each material in 1.0 ml of solvents.
- Then those solutions mixed within an optimum blend ratio of 1:4.
- No films were coated on the cleaned glass slides.

**SAMPLE FABRICATION FOR TOF**
- The OT temperature was fixed at the substrate temperature.
- The ITO films were sandwiched between the two electrodes to measure the photocurrent and mobility.

**ANNEALING OF THE SAMPLES AND CHARACTERIZATION**
- The solar cell samples fabrication is in process.
- The TOF samples were fabricated in the sandwich configuration.
- Power efficiency of a PV cell are associated with the formation to fuse D/A networks increases the charge transport.
- The solar cell samples fabrication is in process.

**RESULT**
The fabricated cells were characterized using I-V curves. Initial results gave an efficiency ~1.75 % at room temperature with a short-circuit current of ~4.2 mA/cm2 and open-circuit voltage of 0.57V. While the best operation temperature was found ~close to 50 °C.

**CONCLUSION**
- Renewable energy is considered a revolution in the energy world nowadays.
- Solar energy is one of the important types of renewable energy, especially in Gulf countries.
- OSC is a type of solar cells that can produce electricity from the visible light.
- We have fabricated in-house OSC solar cells using standard techniques.

There are four different regimes of efficiency changes during the increase of temperature:
- Below 30 °C, the efficiency is constant and almost the same.
- Between 32 °C and 52 °C, the efficiency has increased, almost three times of initial value.
- Between 54 °C and 58 °C, the efficiency remains the same.
- Above 58 °C, the efficiency drops drastically.

**SIGNIFICANCE**
The students will be given proper training and guidance towards the successful fabrication and characterization of solar cells. This will be a great opportunity for these students to mold their future research career in the path of renewable energy. The project fosters developing technical as well as soft skills of undergraduate students through such high-profile experimental research experience by addressing one of the alarming issues locally and globally.

**FUTURE PLANS**
- Different polymers must be explored for the higher stability of organic Solar cell.
- Device should be characterized for the different thickness level of the PCBM and PCPDTB.
- Scalability of the organic cell must be explored.