



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : Ashish Singh

Roll Number : 126153004

Programme of Study : Ph.D.

Thesis Title: **Influence of Electrode Buffer Layers in Plasmonic Bulk Heterojunction Solar Cells**

Name of Thesis Supervisor(s) : Prof. Parameswar K. Iyer

Thesis Submitted to the Department/ Center : Centre for Nanotechnology

Date of completion of Thesis Viva-Voce Exam : 19-02-2018

Key words for description of Thesis Work : **Plasmonic Bulk Heterojunction Solar Cells, P3HT:PCBM, Cathode Buffer Layers, Metal Nanoparticles**

---

SHORT ABSTRACT

The demand of cost efficient organic bulk heterojunction (BHJ) solar cells and different device architecture modulation methods are of prime importance for improving the power conversion efficiency (PCE) values. This thesis mainly focuses to modify the cathode and anode buffer layers to improve the PCE of very commonly studied organic BHJ system, namely, regioregular poly(3-hexylthiophene-2,5-diyl) (rrP3HT):[6,6]-Phenyl C<sub>61</sub>/71 butyric acid methyl ester (PC<sub>61</sub>/71BM). For modulating cathode contact, different types of hole and electron rich small molecules were introduced in the device structure, whereas, to modulate the anode contact various types of easily synthesized plasmon induced metal (Gold and Silver) nanoparticles were doped in the hole injecting PEDOT:PSS layer. The thesis mainly introduced a very simple, unique and robust methodology consisting of the combined effect of dual cathode buffer layers and different shaped plasmon induced metal nanoparticles for improving the PCE value as well as the morphological information of very commonly studied rrP3HT:PCBM system which can be further used in the next generation of solar cell technology.