The University of Queensland - IIT Delhi Academy of Research Joint PhD Project

PROJECT TITLE	**UNRAVELLING THE CHARGE GENERATION PATHWAYS IN ORGANIC AND HYBRID SOLAR CELLS**
PROJECT CODE	**UQIDAR 00177**
PROJECT DESCRIPTION	The next generation of solar cells based on organic and hybrid semiconductors can be solution processed over large areas leading to solar cells that are cheaper than current technology as well as being lighter and flexible. Current state-of-the-art performance for organic and hybrid solar cells are 16% and 25%, respectively. The key to this record performance has been the development of new materials and improved device architectures. However, understanding the photo-physical properties of these novel solar materials, in other words, the series of steps that need to occur for light to be converted into charge, remains a challenge. The aim of this project is to use time-resolved spectroscopy to probe the photo-physical properties of materials for organic and hybrid solar cells. The use of time-resolved optical spectroscopy is critical as the charge generation processes occur on very short timescales that cannot typically be observed from electrical measurements. Specifically, transient absorption and time-resolved terahertz spectroscopy will be employed to probe the formation and recombination of charge carriers on timescales from the femtosecond to the microsecond. The use of time-resolved spectroscopy will provide unique insights into the mechanism of charge generation in the next generation of solar cells, which in turn will guide the design of future materials and more efficient solar cells.
PROJECT OUTCOMES	• The success of this research proposal will deliver the following outcomes: • Novel methods and techniques for probing the photo-physical properties of solar cell materials • New fundamental knowledge of how charges are generated in organic and hybrid solar cell materials. • Design rules for designing solar materials and processes for maximizing their performance.
ADVISORY TEAM	**Dr Paul Shaw** https://scmb.uq.edu.au/profile/561/paul-shaw p.shaw3@uq.edu.au School of Chemistry and Molecular Biosciences The University of Queensland **Assistant Professor Sunil Kumar** http://web.iitd.ac.in/~kumarsunil/ kumarsunil@physics.iitd.ac.in Department of Physics Indian Institute of Technology Delhi
TYPE OF STUDENT	Applications are open to i students who meet eligibility criteria. note: i-students must have own scholarship to apply (CSIR, UCG-NET, etc)
DISCIPLINE BACKGROUND OF STUDENT	Ideally, this project requires students with a background in physics, physical chemistry

IDEAL CANDIDATE	Essential capabilities: • Experience in semiconductor physics • Practical experience involving lasers and optics and/or optical spectroscopy of materials Desirable capabilities: • Prior experience in organic electronics, such as, film preparation, device fabrication and testing Expected qualifications (courses, degrees, etc): • Masters or equivalent in physics/physical chemistry with a thesis/research component
APPLICATION PROCESS	Apply online by the due date: https://www.uqidar.org/students/how-to-apply/