

WORKSHOP ON
THIN FILM SOLAR CELLS

APRIL 16-17, 2018



Department of Chemistry
Indian Institute of Technology Roorkee
Roorkee-247667, India

Aim of the Workshop

The biggest challenge of the 21st century is meeting the growing needs of energy (power) for the development of a sustainable society. With decreasing reserves of fossil fuels and risks associated with nuclear power, importance is being given for renewable energy resources, solar in particular. Solar radiation reaching the earth's surface is clean, in abundance and free of cost. A photovoltaic solar cell working at moderate efficiency (10-15%) can easily meet all the power needs. Three generations of solar cells are under development. Solar cells made of Si have already made a big impact, used as a crystalline wafer (1st generation) or as polycrystalline films (2nd generation). 3rd

Generation solar cells involve several innovative designs, drawing on our ability to grow organized structures on a nanometric scale with full control of structural and morphological properties.

In this tutorial workshop, in a series of lectures, we will review the design and operating principles of these three generations of solar cells. In addition, we shall present an overview of the state-of-art in the scaling and commercialization of these solar cells. The lectures will be supplemented by **brief hands-on sessions with simple do-it-yourself experiments on the fabrication of these solar cells** and their use in powering portable electronics such as mobile phones and LED lights.

Topics to be addressed in the lectures:

1. Fundamentals of solar energy harvesting: features of solar radiation; approaches to solar energy conversion and storage; design of a solar cell; efficiency limits for energy conversion,
2. Basics of first generation (wafer-based) and second generation (thin film) solar cells
3. Overviews of third generation solar cells
 - Dye-sensitized solar cells (DSSCs)
 - Perovskite/quantum dots based solar cells
 - Organic polymer solar cells with bulk heterojunctions

4. Mechanistic aspects of third generation solar cells: time-resolved optical and electrochemical spectroscopic studies.

5. Scaling up of small lab cells to modules, packaging issues and commercial production of solar cells

The hands-on session will explain the design of solar photovoltaic power systems for small (W) to larger (kW and MW) installations, portable solar powering devices and do-it-yourself fabrication of small devices for solar powering of mobile phones, LED lights and small battery chargers.

Registration

- ❖ There is no registration fee
 - ❖ Registration can be done using the link <https://goo.gl/forms/dH3uMG5T0V5zgp3l2>
- Last date for Registration: 13th April 2018
- ❖ Certificate will be provided

Resource Person

Prof. K. Kalyanasundaram
Laboratory for Photonics and Interfaces
EPFL at Lausanne, Switzerland

Convener

Dr. M. Sankar
Department of Chemistry
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Program Schedule

Day 1

16/04/2018 (Monday)

Day 2

17/04/2018 (Tuesday)

08:45 am to 09:15 am	Registration	09:30 am to 11:00 am	Lecture 5: Mechanistic aspects of third generation solar cells
09:15 am to 09:30 am	Inaugural Session	11:00 am to 11:30 am	Tea Break
09:30 am to 11:00 am	Lecture 1: Fundamentals of solar energy harvesting	11:30 am to 01:00 pm	Lecture 6: Scaling up of small lab cells to modules, packaging issues and commercial production of solar cells
11:00 am to 11:30 am	Tea Break	01:00 pm to 02:00 pm	Lunch
11:30 am to 01:00 pm	Lecture 2: Basics of first generation (wafer-based) and second generation (thin film) solar cells	02:00 pm to 04:00 pm	Hands-on-Session
01:00 pm to 02:00 pm	Lunch Break	04:00 pm to 04:30 pm	Tea Break
02:00 pm to 03:30 pm	Lecture 3: Dye-sensitized solar cells (DSSCs) and Perovskite/ quantum dots based solar cells	04:30 pm to 05:00 pm	Valedictory Session
03:30 pm to 04:00 pm	Tea Break		
04:00 pm to 05:30 pm	Lecture 4: Organic polymer solar cells with bulk heterojunctions		