

Organic Solar Cells: Physics and Current Research Trends

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Objective: The field of Organic thin-film photovoltaic devices (OPV) is rapidly evolving due to their several potential advantages including low cost processing over large area flexible substrates and availability of wide range of materials with tunable optoelectronic properties. Since the demonstration of near 1% solar cell in 1986, considerable effort has been devoted to improvement of power conversion efficiency and values in excess of 8% have recently been reported. The aim of this course is to introduce the participants to the fields of organic semiconductors and photovoltaics. The course includes an overview of organic semiconductor physics, fundamentals of organic solar cells, discussion on distinctive properties of organic solar cells and challenges for commercialization. The course requires only a general background in semiconductor device physics and should be of interest to all those who either wish to work in the field of organic semiconductors.

Course Outline

1. Physics Of Organic Semiconductors:
 - Electronic structure Of Conjugated Organic Molecules
 - Absorption and recombination
 - Transport and Injection
 - Current-Voltage Characteristics
2. Organic Solar Cells:
 - Basics of Solar Cells
 - Single Layer, bilayer and bulk heterojunction Solar cells
 - Strategies for Improving Efficiency
 - Reliability, Module design
3. . Organic Solar Cells:
 - Open Circuit Voltage
 - Fill Factor
 - Equivalent Circuit Models
 - Series/Shunt Resistances