NCPRE NEWS

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National Centre for Photovoltaic Research and Education
www.ncpre.iitb.ac.in
A Project of the Ministry of New and Renewable Energy at IIT Bombay

Several Research Papers on New Materials presented at Spring 2017 Meeting of Materials Research Society (MRS)

NCPRE has research activities grouped in five major areas: Crystalline Silicon Solar Cells, Thin Film Materials and Devices, Energy Storage, Power Electronics and Module Reliability. **This month's Newsletter focuses on recent research activities on Thin Film Materials and Devices.**

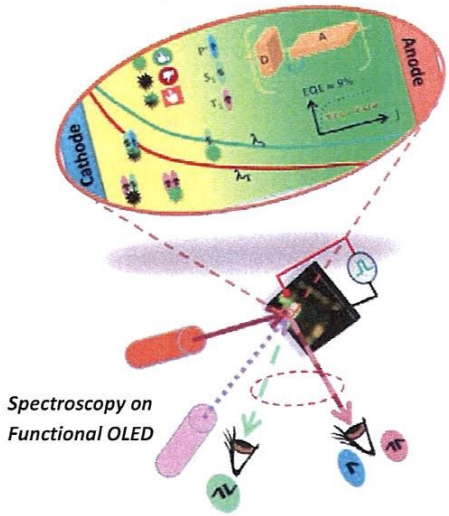
The Thin Film Materials and Devices group in NCPRE is a **highly inter-disciplinary group, bringing together faculty members and students from several Department at IIT Bombay**: Energy Science & Engineering, Materials Science & Metallurgical Engineering, Electrical Engineering, Physics and Chemistry.

The main deliverables of the Thin Film Materials and Devices Group are to develop: (a) high efficiency large-area organic and **perovskite solar cells**; (b) **new compositions** in the perovskite family; (c) new low-cost **hole-transport materials** for perovskites; and finally (d) high-efficiency **perovskite-on-silicon tandem solar cells**. The last deliverable will leverage NCPRE's unique capabilities in both silicon and perovskite solar cells, and can provide a pathway for **indigenous futuristic solar cell manufacturing.**

Four papers from the Thin Film Materials and Devices Group were presented recently at the **prestigious Spring Meeting of the Materials Research Society (MRS) held in USA in April 2017.** These papers focused on work done in the area of low-temperature solution-processible materials organic and perovskite devices.

Organic semiconductor based solar cells (OSCs) and light-emitting-diodes (OLEDs) were prepared in the NCPRE labs. The OSCs were characterized using **advanced spectroscopic techniques to understand the energetic disorder which influences the photo-induced charge generation / recombination pathways and transport in solar cells.** In OLEDs, the competing processes of annihilation and radiative channels were quantitatively determined using an **innovative custom-made dual pump-probe spectroscopy on functional OLEDs.**

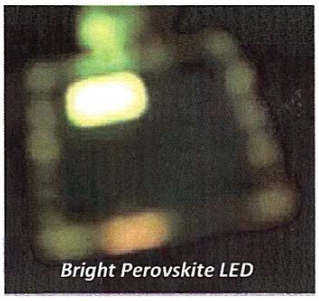
Organic Solar Cell (OSC) fabricated at NCPRE



Spectroscopy on Functional OLED

In perovskite semiconductors, the NCPRE researchers presented a paper on **fundamental understanding of the unusual *decrease* of semiconductor bandgap E_g** with respect to decrease in temperature, and showed that shrinkage of lattice size upon cooling is the root cause of this anomalous behaviour.

Another paper touched upon the very challenging issue of **morphology of perovskite films,** which governs device physics of opto-electronic devices. State-of-the-art highly efficient perovskite LEDs (PeLEDs) were fabricated using $CH_3NH_3PbBr_3$ which emits in green color, and the efficiency parameter of this device was correlated with the morphology of the perovskite film.



Bright Perovskite LED