



July 2017

National Centre for Photovoltaic Research and Education

[www.ncpre.iitb.ac.in](http://www.ncpre.iitb.ac.in)

A Project of the Ministry of New and Renewable Energy at IIT Bombay

## NCPRE Deepens Its Engagement with the Silicon Solar Cell Industry in the Country

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 crystalline silicon solar cells.

The main deliverables of this activity are to develop: (a) 6 inch Al-BSF cells with efficiency of 19% (b) 20% efficient 6 inch PERC solar cells and (c) 22% efficient IBC solar cells (d) 15% efficient carrier selective contacts. The last one would also feed into NCPRE efforts to develop perovskite-silicon tandem cells.

NCPRE has developed a baseline Al-BSF process on 6 inch wafers with an efficiency of 18.2% (active area efficiency of 20%). Extensive infrastructure for characterization of solar cells, including an indigenously developed photoluminescence imager with associated software, has also been set up.

For Al-BSF, PERC and IBC cells, *low cost* copper metallization, solution processed passivation layers and screen printed junctions are being developed.

The silicon group has developed interactions with Indian solar cell manufacturers, material suppliers and equipment developers on the following topics: (i) Extensive characterization of cells manufactured in Indian companies and loss analysis for those technologies. This has helped 3 companies to identify priority areas for development. (ii) Co-development of silver paste with an Indian chemical company, where NCPRE has fabricated cells with the paste developed by the company and provided inputs on areas of improvement. (iii) Development of a wet chemical process for the texturization of multi crystalline silicon wafers cut by diamond wire saw (DWS) process. DWS has the potential to reduce wafer cost by about 25%. However, multi crystalline silicon cut using DWS cannot be textured using the present industrial processes. NCPRE process is being demonstrated with an Indian cell manufacturer, wherein competitive efficiencies values have been obtained. In this case, the wafers were textured at NCPRE and cell

fabrication completed at the industry partner's production line. Further optimization is expected to lead to a process with potential for industrial application.

NCPRE is also partnering with National Physical Laboratories (NPL), National Institute of Solar Energy (NISE) and PTB Germany to develop secondary solar cell calibration facilities in the country. This is expected to reduce the industries' dependence on imported reference cells.



Dr. Johannes Rostan, CTO of Adani Solar delivering his talk on "Beyond Al-BSF Technology – What is Next for Crystalline Silicon" in the workshop on "Silicon Solar Cell and Thin Film Module Manufacturing in India", at IIT Bombay.

NCPRE organized a one day workshop on "Silicon Solar Cell and Thin Film Module Manufacturing in India" on 17<sup>th</sup> July 2017. The objectives were to identify challenges and opportunities in (i) manufacturable technology, (ii) manpower requirements in industry and R&D (iii) manufacturing and commercial challenges and (iv) appropriate policy for promotion of PV manufacturing in the country. The objectives and expectations from the workshop were outlined by Prof. Ashok Jhunjhunwala, Principal Advisor to the Minister of Power and Renewable Energy, Government of India. Leading technology managers from 12 solar industrial houses/industry association, and representatives of academic institutions and MNRE participated in the workshop.