

Report of the Webinar

on

**“Excitonic Photovoltaic Technology: Development, Structure, Working Mechanism, Materials, Optimization, and Device Fabrication”**

Conducted on **23rd December, 2025**

Organized by

**Department of Basic Sciences & Humanities,  
College of Engineering and Management, Kolaghat, WB, India.  
KTPP Township, Purba Medinipur, WB – 721171**

Platform: Online (Google meet)

## **I. About the College**

The College of Engineering and Management, Kolaghat, is a premier engineering institute established in September 1998 and run by the Vidyasagar Society for Integrated Learning (VSIL) under the Department of Power, Government of West Bengal. The institution is governed under strong leadership, with the Hon'ble Minister-in-Charge of the Department of Power, Government of West Bengal, serving as the Chairman of the college.

The college is approved by the All India Council for Technical Education (AICTE) and is affiliated with Maulana Abul Kalam Azad University of Technology, West Bengal (formerly known as WBUT). Spread over a lush 32-acre campus, the college is located within the integrated township of the Kolaghat Thermal Power Plant, managed by WBPDC.

The institution offers six undergraduate B.Tech programs, namely Computer Science and Engineering (NBA accredited), Artificial Intelligence and Machine Learning, Information Technology, Mechanical Engineering, Electronics and Communication Engineering, and Electrical Engineering. The college provides an ideal academic environment for students and faculty members to pursue excellence in education, research, and overall professional development.

## **II. Background of the Webinar**

**Excitonic photovoltaic technology** converts solar light into electrical energy through the generation of excitons (bound electron-hole pairs) rather than free charge carriers as in conventional silicon solar cells. Growing interest in this technology is driven by advances in organic, polymer, dye-sensitized, and perovskite materials, which offer low-cost processing, flexibility, and tunable optoelectronic properties. These devices typically consist of layer-by-layer architectures with nanometer-scale thickness that facilitates light absorption, exciton generation, diffusion, dissociation at donor-acceptor interfaces, efficient charge transport to electrodes and finally charge collections through carefully engineered interfaces and energy-level alignment. Ongoing research focuses on improving light absorption, charge mobility, interfacial engineering, morphology control, phase separation, device stability and fabrication techniques for practical and commercial applications.

## **III. Organizing Committee**

Prof. Dilip Kumar Gayen (Patron)  
Director, CEMK  
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Dr. Anirban Das (Advisor)  
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Dr. Amit Kumar Jana (Coordinator)  
Assistant Professor, Department of Basic Sciences and Humanities  
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#### IV. Resource Person

Welcome Address by Dr. Anirban Das  
Head of the Department, Basic Sciences and Humanities  
Email id: [hodbsh@cemk.ac.in](mailto:hodbsh@cemk.ac.in)  
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Keynote Address by Prof. Dilip Kumar Gayen  
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Plenary Talk by **Dr. Asit Patra**  
Senior Principal Scientist, CSIR-National Physical Laboratory, New Delhi.  
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**V. Audience:** Faculty members, Staff members and Students

**Registration fee:** NIL

**Link to join the webinar:** <https://meet.google.com/pov-sqbd-nwf>  
(Not active now)

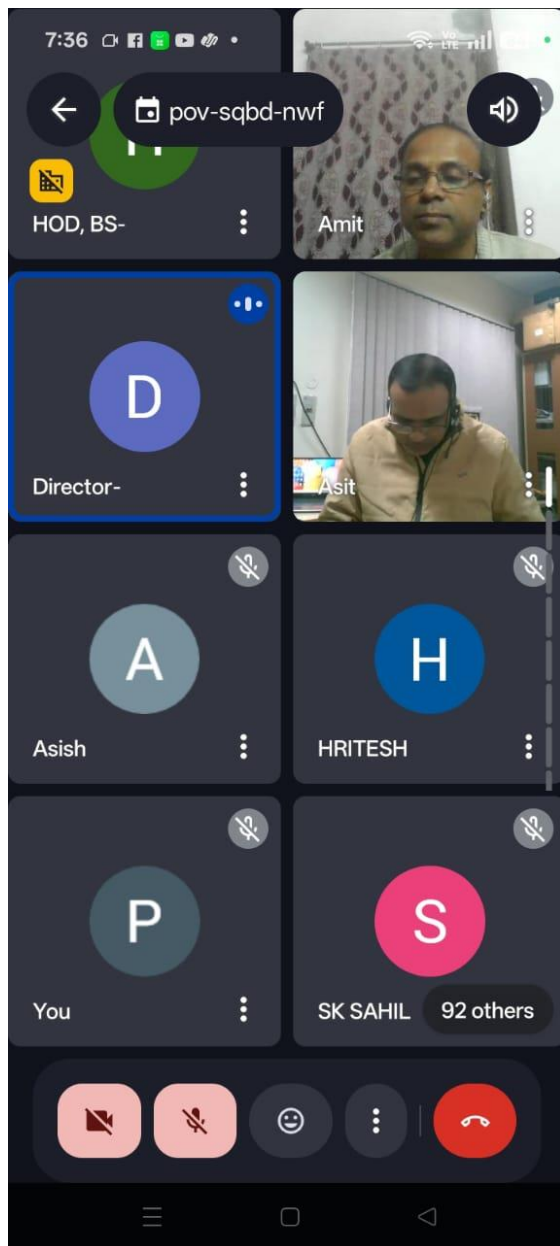
#### VI. Program Schedule

1. Introduction by Moderator/Coordinator	7.30 PM to 7.32 PM
2. Welcome Address by HOD	7.33 PM to 7.35 PM
3. Keynote Address by Director	7.36 PM to 7.39 PM
4. Plenary Talk by Speaker (including interactions with the participants)	7.40 PM to 8.30 PM
5. Vote of Thanks by Coordinator	8.31 PM to 8.33 PM

**VII. PPT** of the Talk attached

### VIII. Screenshots of online session:

(a) Key note address by the Director



(b) Plenary talk by Dr. Asit Patra

The image displays two side-by-side screenshots of a mobile phone screen during a Zoom meeting. The top half of the screen shows a presentation slide titled "Perovskite solar cells". The slide is divided into two main sections: "Types of perovskite solar cells" and "Working Principle".

**Types of perovskite solar cells:**

- Mesoporous architecture:**
  - Conventional (n-i-p):** Consists of a Substrate, Electron Transport Layer, Perovskite Layer, Hole Transport Layer, and Transparent Conducting Oxide.
  - Inverted (p-i-n):** Consists of a Substrate, Hole Transport Layer, Perovskite Layer, Electron Transport Layer, and Transparent Conducting Oxide.
- Planar architecture:**
  - Conventional (n-i-p):** Consists of a Substrate, Electron Transport Layer, Perovskite Layer, Hole Transport Layer, and Transparent Conducting Oxide.
  - Inverted (p-i-n):** Consists of a Substrate, Hole Transport Layer, Perovskite Layer, Electron Transport Layer, and Transparent Conducting Oxide.

**Working Principle:** A graph shows the energy levels (eV) of various materials. The y-axis ranges from -10 to +1. The materials and their approximate energy levels are: FTO (-4.4 eV), TiO<sub>2</sub> (-4.2 eV), MAPbBr<sub>3</sub> (-2.5 eV), Spiro-OMeTAD (-5.2 eV), Au (-5.1 eV), and TiO<sub>2</sub> (-6.0 eV). Arrows indicate the flow of electrons from the perovskite layer to the electron transport layer and from the hole transport layer to the perovskite layer.

**Organic Solar Cells: Device Structure and Materials:** A diagram shows the structure of a BHJ organic solar cell. The layers are: Electron Transport Layer (Polymer: PPN conjugated polyelectrolyte), Active Layer Mixture of Donor & Acceptor Materials (P3HT and PCBM), Hole Transport Layer (PEDOT:PSS), and ITO. The thicknesses are: ETL ~ 5-20 nm, Active layer ~ 80 nm, HTL ~ 40 nm, and ITO. The materials listed are: Small molecules: PDI based; Inorganic: Cu, ZnO, TiO<sub>2</sub>; Small molecules: PDI based; Carbon nanotubes (CNTs); MoO<sub>3</sub>, V<sub>2</sub>O<sub>5</sub>, NiO.

**Perovskite Solar Cells:** A diagram shows the structure of a Perovskite solar cell. The layers are: Inverted (FTO, Perovskite, Metal) and Regular (ITO, Perovskite, Metal).

The bottom half of the screen shows the Zoom interface. At the top, it says "Asit is presenting". Below this, there is a video feed of a man named Asit. To the right of the video feed, it says "97 others". At the bottom, there is a list of participants, including "You" and "Asit".

## **IX. Feedback Form**

The feedback form is sent through the following link:

<https://docs.google.com/forms/d/e/1FAIpQLSfwlaP8PDcuNlnBkopcgObaQJtKbDk4quEhp48hFsX-AGVhhA/viewform?usp=publish-editor>

## **X. Number of participants**

Total 100 participated in the program.

## **XI. Certificates**

Certificates are being provided to all participants. A sample copy is attached.