

A MULTI-SOURCE ENERGY HARVESTER DEVICE AND A METHOD THEREOF IITM Technology Available for Licensing

Problem Statement

- Existing **energy harvesting devices** are limited in their ability to **capture energy from multiple sources** using a single device, hindering the **advancement of efficient energy harvesting technology**.
- There is a need for a **versatile and reliable multi-source energy harvester** that can efficiently harness electrical energy from various sources in a single device, **addressing the limitations of current energy harvesting solutions**.

Technology Category/ Market

Category – Energy Harvesting System, Renewable energy.

Applications – Renewable energy, Remote sensing, Environmental Monitoring, IOT.

Industry – Renewable energy, Power generation

Market - The Global Energy Harvesting System Market registered USD 516.2 Million in 2022 and anticipates to register USD 839.8 Million by the end of 2030. The expected **CAGR for the Energy Harvesting System Industry is 7.2%**.

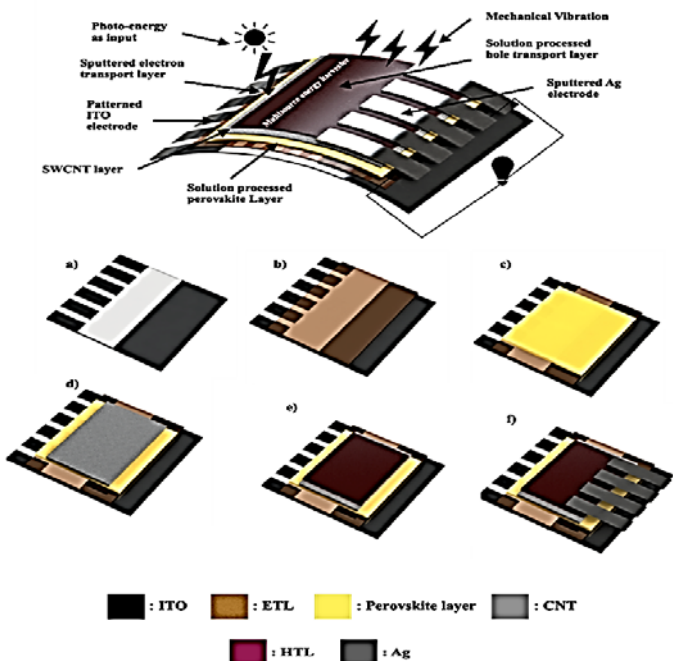


Fig 1. The fabrication process of a MAPbI₃-based perovskite energy harvester involves ITO electrode patterning

Technology

Multi-source energy harvester technology for capturing electrical energy from multiple sources with a single device.

Utilizes a **perovskite layer** as a versatile material that functions as a solar cell, **piezoelectric generator**, and **pyroelectric device**, enabling simultaneous energy harvesting from light, **mechanical vibrations**, and **thermal fluctuations**.

Incorporates **Carbon Nano Tubes (CNT)** to enhance **charge transport** and **reduce losses between layers**, optimizing energy conversion.

Employs **pre-patterned sputtered electrodes** to improve **charge collection efficiency** based on surface area, **increasing overall device performance**.

Offers a **lightweight, flexible, and transparent energy harvesting solution** with **potential applications in wearable electronics and wireless sensor networks**.

Intellectual Property

- IITM IDF Ref. 2463
- IN 534159 (PATENT GRANTED)

TRL (Technology Readiness Level)

TRL- 3/4 Proof of concept is ready and validated in lab.

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Key Features / Value Proposition

Technical Perspective:

- This invention combines **perovskite materials**, **Carbon Nano Tubes**, and **patterned electrodes** to create a **highly efficient multi-source energy harvester**, expanding possibilities for sustainable energy generation.

User Perspective:

- Users benefit from a **lightweight and flexible device** capable of harvesting energy from multiple sources, making it ideal for **powering wearable electronics** and enhancing the sustainability of **wireless sensor networks**.

Image

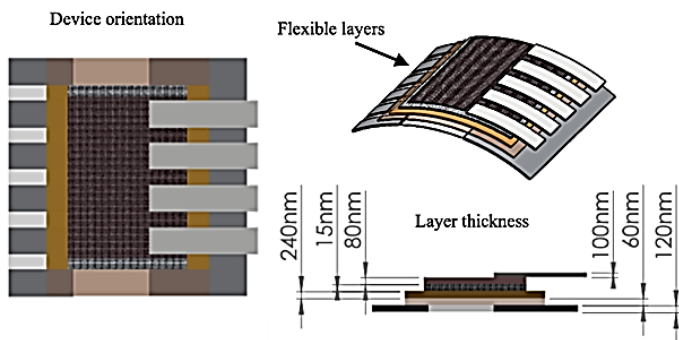


Fig 2. Fabrication process of MAPbI_3 based perovskite energy harvester with layer thickness

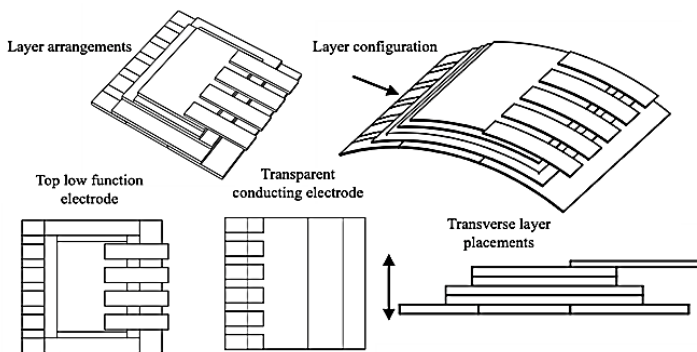


Fig 3. Various layer arrangements based on electrode placements

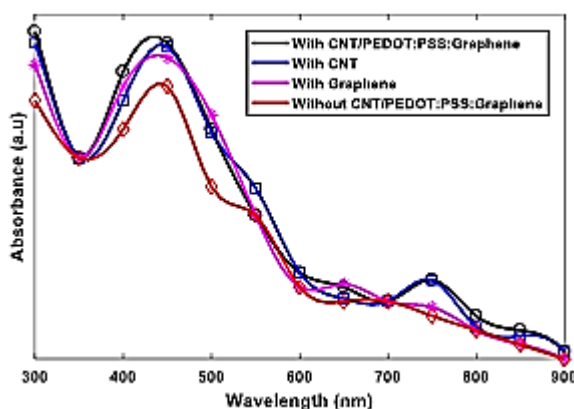


Figure 4. Optical absorption spectra of perovskite films based on CNT and PEDOT: PSS: Graphene

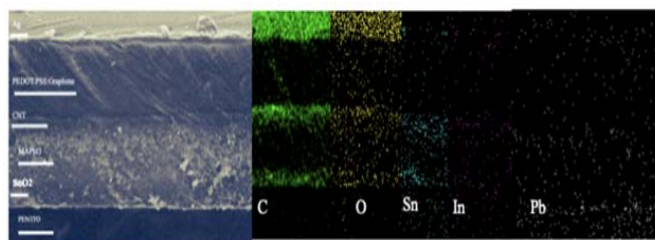


Figure 5. Cross sectional SEM image and elemental analysis of $\text{PEN/ITO/TiO}_2/\text{MAPbI}_3/\text{CNT/PEDOT: PSS: Graphene}$

Research Lab

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