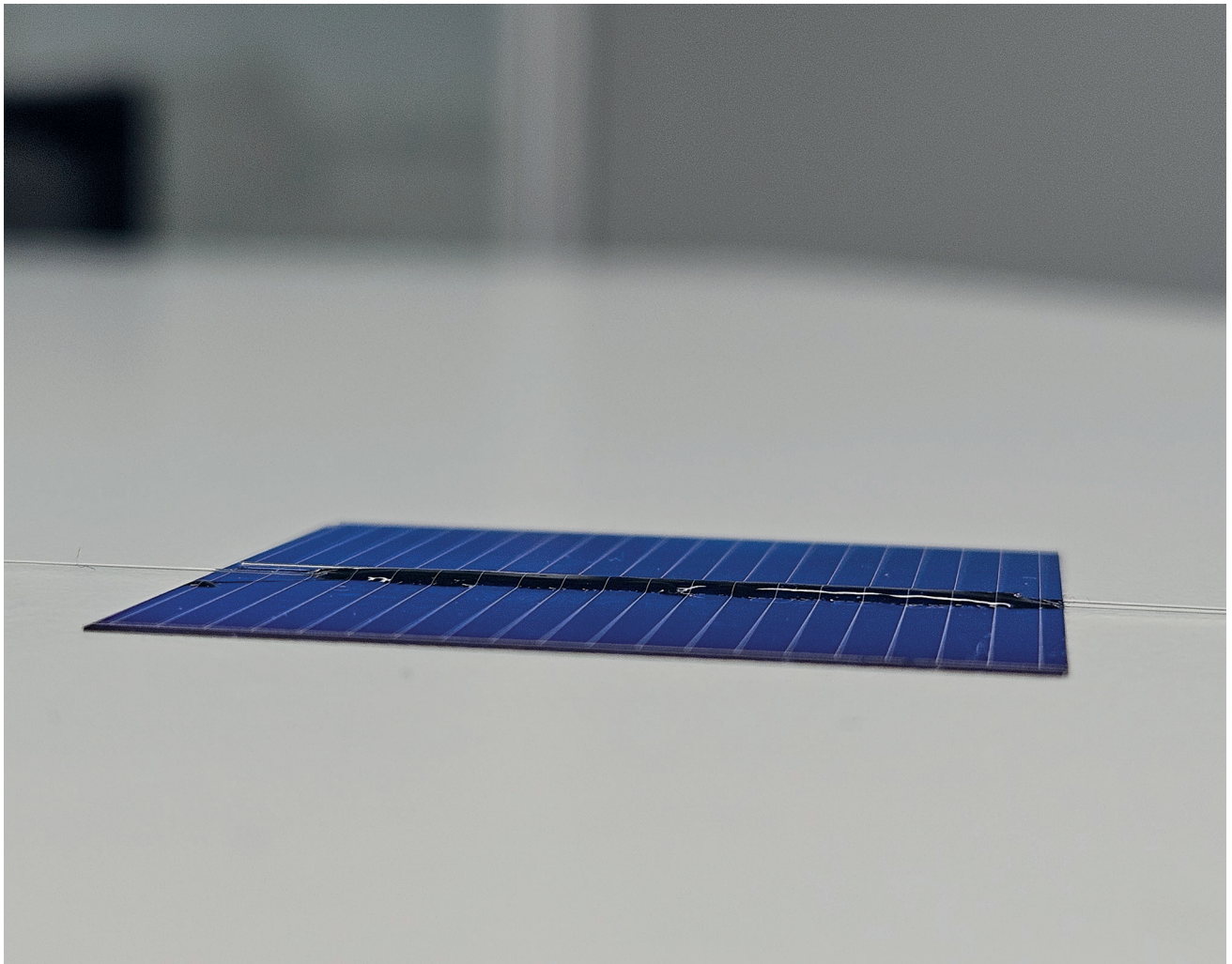




## TECHNOLOGY OPPORTUNITY

# Thermal Monitoring in Laminate Structures Using Fiber Optic Sensors

### OVERVIEW

This innovation of imo-imomec, the joint research institute of Hasselt University and imec, introduces a sensor system for thermal monitoring in laminate structures, particularly for photovoltaic (PV) modules. The system embeds optical fibers with temperature-sensitive transmission characteristics between laminate layers, enabling localized temperature measurements without affecting the performance of the structure.

### PROBLEM AND MARKET NEED

PV modules and other laminated structures are subjected to thermal and mechanical stress that reduce performance over time. Existing methods, such as surface thermocouples, cannot capture internal temperature data, limiting the ability to predict failures or optimize system performance. Moreover, conventional sensors introduce electromagnetic interference and are difficult to integrate into laminate structures without disrupting their function.

IMO-IMOMEC



imec

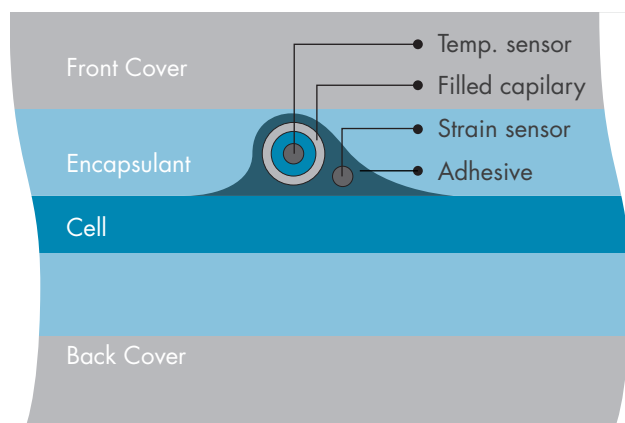


Energy  
Ville

## INNOVATION

This sensor system overcomes these limitations by embedding optical fibers with Fiber Bragg Grating (FBG) technology inside capillary tubes. These fibers provide high-precision temperature data by measuring changes in the wavelengths of light reflected by the gratings. This technology can also be integrated as strain sensor for simultaneous mechanical and thermal monitoring.

Key components (photovoltaics example):



## UNIQUE SELLING POINTS

- Non-Intrusive: Embedded sensors do not interfere with the laminate's functionality.
- High Precision: Localized, real-time temperature monitoring with minimal noise.
- Broad Applicability: Suitable for PV modules, smart building glass, and industrial transparent laminates.
- Low EMI: Optical-based monitoring ensures resistance to electromagnetic interference.

## APPLICATIONS

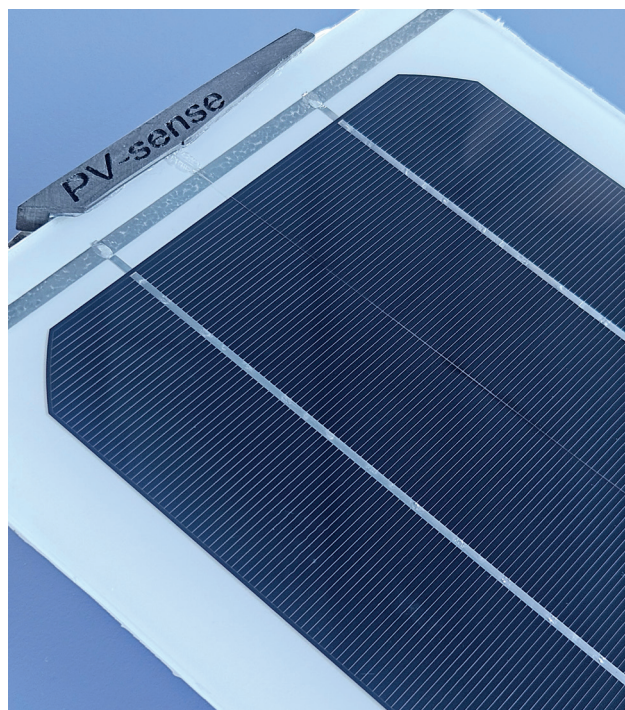
- Photovoltaic Modules: Monitors internal temperatures and mechanical strains during production process and during long term use, to improve performance and durability.
- Architectural Glass: Embedded in smart building glass without compromising transparency.
- Industrial Transparent Laminates: Provides thermal data for quality control and predictive maintenance.

## MARKET POTENTIAL

The global PV market is rapidly expanding, with increasing demand for performance monitoring solutions. The FBG technology for temperature and strain sensing offers unmatched precision and predictive maintenance capabilities. Especially the upcoming market of integrated PV will require a thorough understanding and monitoring of PV module mission profiles. The system also has potential in architectural glass, offering potential for monitoring thermal management.

## INTELLECTUAL PROPERTY

The invention has been protected through a patent application (EP3913798B1 and US20230194361A1)



## CONTACT

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