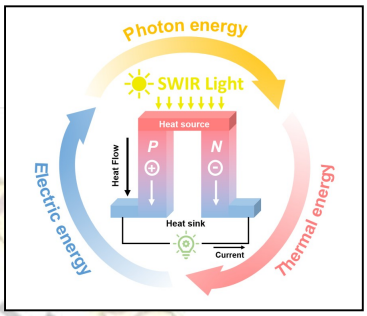
# 附件四、技術說明表

## 短波紅外光熱電轉換與偵測裝置及其製造方法




**提案人：** **劉振良** 教授
**單　位：** 國立臺灣大學　材料科學與工程學系/研究所
**簡　歷：** https://homepage.ntu.edu.tw/~liucl/index.html (研究室網頁)

**市場及需求:**
本技術可應用於太陽能與光通訊產業，不僅能回收太陽光中約三分之一的短波紅外光能量，提升整體能源利用效率，以因應台灣能源供應有限與短缺的挑戰；同時亦可作為光通訊系統中的短波紅外光訊號偵測元件，滿足市場對高效且低成本之能源回收與短波紅外感測裝置的需求。

**技術摘要(含成果):**
本技術以光熱電轉換為核心，結合光熱轉換與熱電效應，並以開殼層結構高分子構建多功能光熱電元件。其可將短波紅外光（1000-2500 nm）有效轉換為熱能並進一步產生電能，實現太陽光中短波紅外區域的高效能量回收；同時亦具備對長波紅外光訊號（>1500 nm）之高靈敏偵測能力。

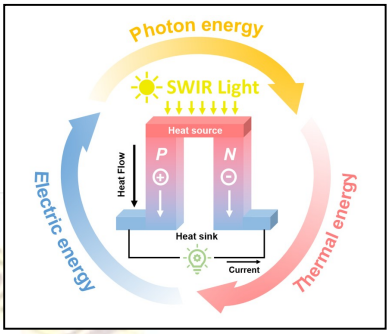
**優勢:**
1. 可與現有太陽能模組進行整合，提升太陽光能使用率。
2. 光學波段之偵測範圍廣，可涵蓋近紅外光以及短波紅外光波段。
3. 製備簡單，材料可撓曲，適合大面積應用。

**競爭產品:**
現行短波紅外光能源轉換及偵測裝置，主要採用無機材料(如:InGaAs)，成本高、製程複雜且功能單一。

**專利現況:**
本研究團隊為台灣少數具備有機光熱電、有機熱電、有機複合熱電及離子熱電研究經驗的團隊，自 2020 年起已在相關領域發表約 30 篇國際期刊論文，具備完整技術基礎與專利布局潛力。

**聯絡方式(請不用填):**
臺大產學合作總中心
Tel: 02-3366-9945,　E-mail: ordiac@ntu.edu.tw

# Short-Wave Infrared Photothermoelectric Conversion and Detection Device and Fabrication Method Thereof




**PI：** Prof. **Cheng-Liang Liu**

Department of Materials Science and Engineering, National Taiwan U.

**Experience:**

https://homepage.ntu.edu.tw/~liucl/index.html

**Market Needs:**

This technology can be applied in the solar energy and optical communication industries. It enables the harvesting of approximately one-third of the short-wave infrared (SWIR) portion of sunlight, improving overall energy utilization efficiency and helping address Taiwan's limited energy supply. It also functions as a SWIR signal detection component in optical communication systems, meeting the demand for efficient, low-cost sensing and energy-harvesting devices.

**Our Technology:**

This technology is based on photothermoelectric conversion, integrating photothermal conversion and the thermoelectric effect, and uses open-shell polymers to construct multifunctional devices. It efficiently converts short-wave infrared light (1000-2500 nm) into heat and then electricity, enabling high-efficiency energy harvesting from the SWIR portion of sunlight, while also providing high-sensitivity detection of long-wave infrared signals (>1500 nm).

**Strength:**

(1) Capable of integration with existing solar modules to enhance solar energy utilization efficiency. (2) Broad optical detection range, covering both the near-infrared (NIR) and short-wave infrared (SWIR) regions. (3) Simple fabrication, with flexible materials suitable for large-area applications.

**Competing Products:**

Current short-wave infrared (SWIR) energy conversion and detection devices mainly rely on InGaAs or other inorganic materials, which are costly, involve complex fabrication processes, and offer limited functionality.

**Intellectual Properties:**

Our research team is one of the few in Taiwan with expertise in organic photothermoelectric, organic thermoelectric, organic composite thermoelectric, and ionic thermoelectric research. Since 2020, we have published approximately 30 international journal papers in these related fields, demonstrating a solid technical foundation and strong potential for patent development.

**Contact (do not need to fill out):**

Center for Industry-Academia Collaboration, NTU

Tel: 02-3366-9945, E-mail: ordiac@ntu.edu.tw