

可撓式CIGS太陽電池非真空試量產線開發計畫

執行單位

工研院綠能所

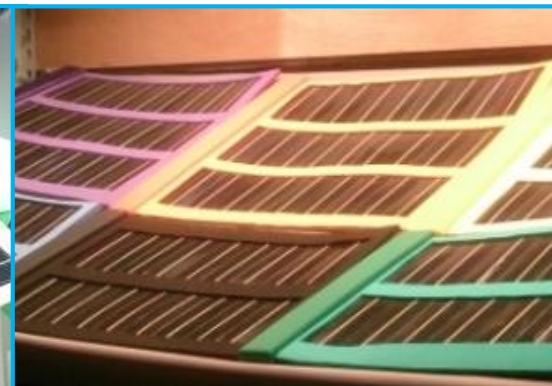
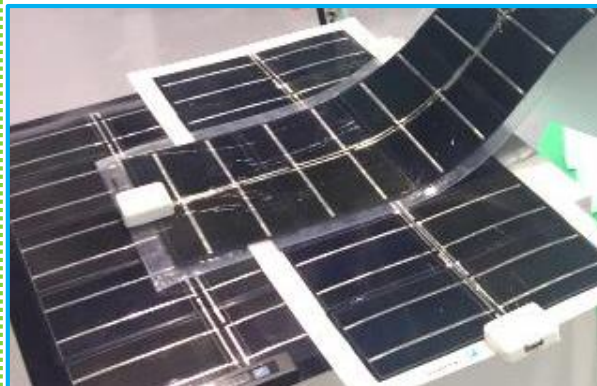
計畫主持人

蔡松雨

- 傳統矽晶太陽電池具有易碎及笨重的問題，輕巧、便利的太陽電池需求一直未被滿足，本技術提供隨身及輕量化太陽電池，可導入充電薄膜、輕屋頂發電系統、移動式輕型發電站等產品。

專利申請

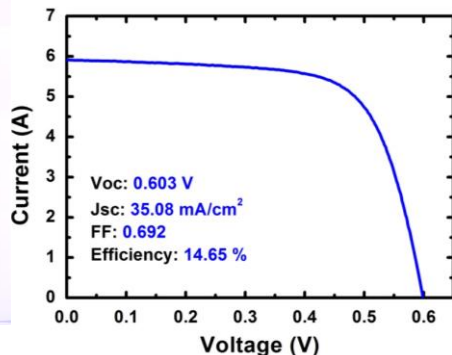
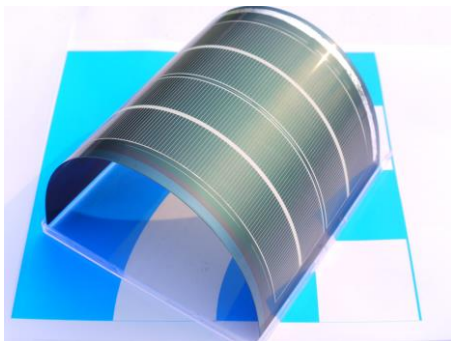
- 奈米晶體薄膜設備及太陽電池之製法
- 太陽能電池模組
- 化合物太陽能電池以及光吸收層的製作方法
- 封裝結構及太陽能電池模塊
- 光吸收層之改質方法



可撓式CIGS太陽電池非真空試量產線開發計畫

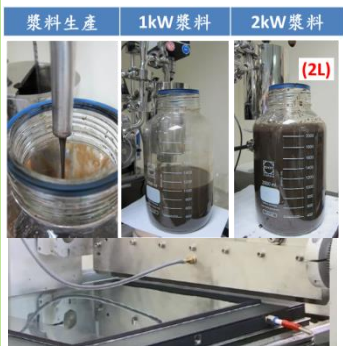
◆ 研發成果

建置試量產系統及關鍵技術開發，包括試量產型連續式濺鍍系統及金屬與透明導電膜鍍膜技術、高產能捲對捲塗佈及乾燥技術、全球第一套多片式商用型低廢液化學水浴法鍍膜設備及技術、全球首創可傳動式高產率平面爐及硒化技術，並建立台灣第一條非真空印刷軟性CIGS太陽電池技術，完成2MW國產可撓式非真空CIGS試量產線，並開發獨步全球的漿料技術。次模組最佳效率達14.6%，並完成14%次模組的良率達80%(2017)。



◆ 技術突破

奈米漿料/塗布試量產



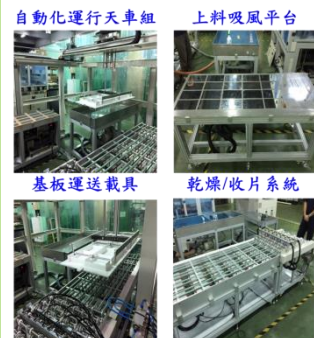
- 關鍵高分散性漿料配方，平均粒徑 <math>< 100 \text{ nm}</math>，水系漿料
- 採用R2R塗布製程，產能可達40MW

硒硫化平面爐技術



- 全球首創平面式 H_2Se 硒化技術及設備，具極佳的溫度均勻性 ($500 \pm 5^\circ\text{C}$) 搭配傳動式設計，進行試量產

多片式化學水浴鍍膜系統



- 開發全球第一套多片式低廢液化學水浴鍍膜設備，溫度均勻性 $< \pm 1.5^\circ\text{C}$ ，製程時間 ≤ 9 分鐘

The Non Vacuum Pilot Line Development for Flexible CIGS Solar Cell

Execution Unit

Green Energy and Environment Research Lab, ITRI

Project Director

Dr. Song-Yeu Tsai

This project plans to develop high efficiency CIGS mini-modules on flexible stainless steel foils and establish a 2MW mini-module pilot plant.

Patent filing

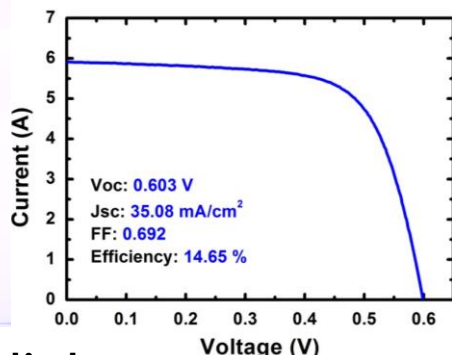
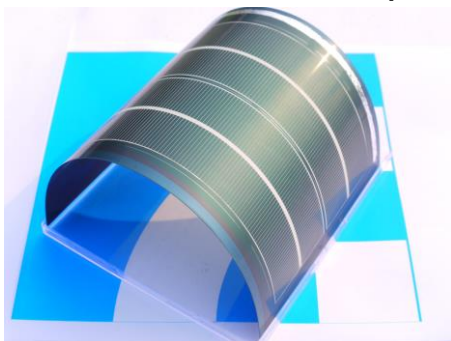
- METHOD FOR FORMING THIN FILM HAVING SULFIDE SINGLE-CRYSTAL NANOPARTICLES
- Photovoltaic module
- Compound-based solar cell and manufacturing method of light absorption layer
- ENCAPSULATION STRUCTURE AND SOLAR CELL MODULE
- METHOD FOR MODIFYING LIGHT ABSORPTION LAYER



The Non Vacuum Pilot Line Development for Flexible CIGS Solar Cell

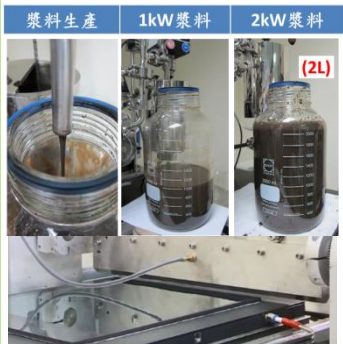
● Content

There are two branch projects including “Large scale precursor deposition technology” and “Development of 2MW CIGS key equipments”. We will focus our efforts on improving high throughput in-line system, nano-particle printing process, selenization furnace and Cd-free chemical bath deposition—all leading to scaling up the technologies for commercial production.



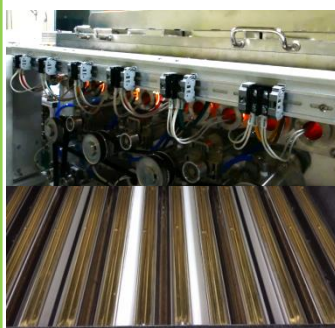
◆ Technology Highlight

Nanoparticle Ink/Printing



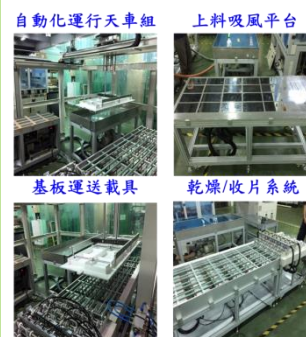
- Slurry capacity > 10 L/day
- slurry lifetime > 1 year
- Particle size: 100 nm

Selenization Furnance



- Developed the world first flat-type selenization furnace with ambient of H_2Se : process time < 20 minutes

Chemical Bath Deposition



- The first multi-slot chemical bath deposition within patent filed.
- Advantages of high yield rate, low waste, and high material utilization