

下世代高效率矽晶太陽電池: 混合型矽鍺與III-V 族太陽電池 設計、製程與設備開發

執行單位

國立中央大學光電系

計畫主持人

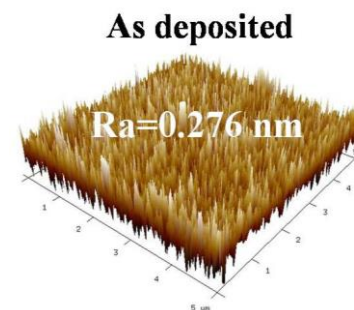
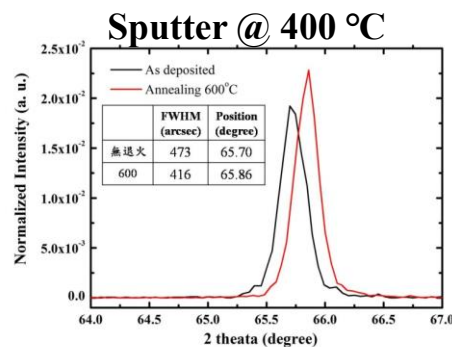
陳昇暉

- 本計畫重點在於開發III-V/Si tandem cells電池關鍵技術佈局。本計畫以一創新性的概念實際將其設計、製程與設備做一個初步的驗證，以雙接面之概念為目標，預期成為下世代高效率太陽能電池之解決方案，作為未來第三代太陽能電池發展的重要技術。

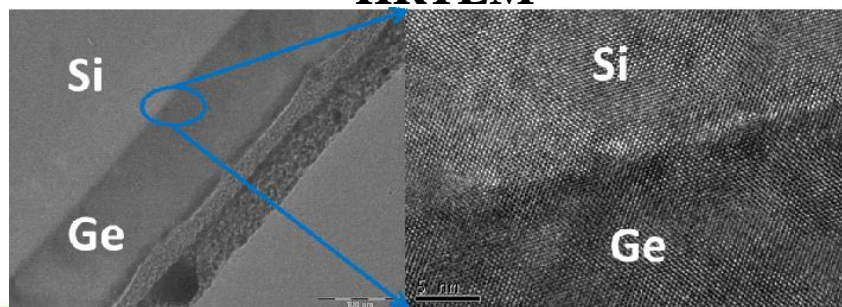
□低溫成長磊晶鍺薄膜於矽基板(新型Ge/Si基板)

已獲得之專利：

- 1.光電轉換元件的基板的製造方法，證書號：I550112，台灣。
- 2.在矽基板上磊晶成長鍺薄膜的方法，證書號：I556285，台灣。
- 3.專利名稱：磁控濺鍍裝置，證書號：I480408，台灣。
- 4.專利名稱：鍍製光學硬膜之封閉式高能磁控濺鍍裝置及其製造方法，申請號：105121174，台灣。已獲得核准，領證中。



HRTEM



● 技術介紹：

利用鍍膜系統於低溫環境下(<300°C)製作磊晶鍍薄膜於單晶矽晶圓上達到符合半導體元件基板品質要求，可大幅降低III-V族半導體元件製造成本與能源成本。

發展情形：

● 技術衍生新創公司

- 1.於2017/10/30成立[進化光學有限公司]，資本額為100萬台幣，公司主要技術為虛擬鍍基板製程技術以及光學薄膜設計與製程技術，目前與鼎展電子股份有限公司共同合作進行開發新產品中。
- 2.於2017/08/08成立真光科技股份有限公司(Adolite Inc.)，資本額1億美元(在臺灣營運資金7,000,000台幣)，主要為開發矽鍍Sensor。

● 技術轉移：

技術名稱<脈衝式磁控濺鍍技術>，團隊新創公司<進化光學有限公司>預計將於2018年1月與中央大學進行技術轉移，技轉金額為100萬新台幣。

技術價值：脈衝式磁控濺鍍不同於以往傳統磁控濺鍍技術，其技術特點在於可經由功率與脈衝頻率間的控制來調整鍍膜能量，使其能夠達到低溫成長高品質磊晶薄膜之成果。

Next generation high efficiency crystalline silicon solar cell: development of the design, process, and equipment for the silicon-germanium and III-V hybrid solar cells

Execution Unit

Department of Optics and Photonics, National Central University

Project Director

Shen-Hui Chen

- This is a proposal entitled of “Next generation high efficiency crystalline silicon solar cell: development of the design, process, and equipment for the silicon-germanium and III-V hybrid solar cells” regarding the development of the double-junction Si/Ge and III-V solar cell which is fabricated on a silicon substrate. The work is significant in that it offers a path to far higher silicon solar cell efficiency than demonstrated to date and hence a path to on-going cost reductions.

□ Sputtering the Ge epi-layer at low temperatures (Novel virtual Ge substrate)

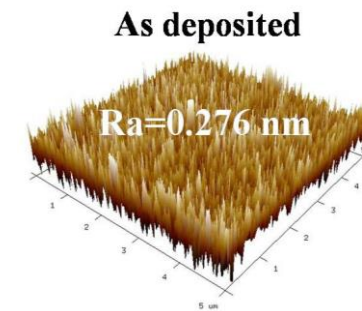
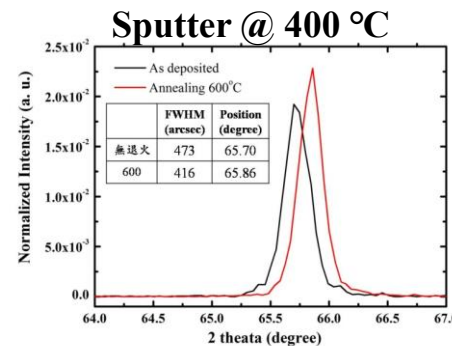
Patent:

1. MANUFACTURING METHOD OF SUBSTRATE OF PHOTOELECTRIC CONVERSION DEVICE, No.: I550112, Taiwan.

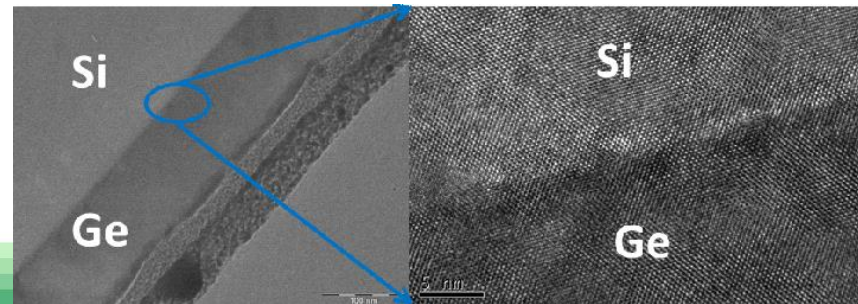
2. METHOD FOR EPITAXIAL GROWING GERMANIUM FILM ON SILICON SUBSTRATE, No.: I556285, Taiwan.

3. 磁控濺鍍裝置, No.: I480408, Taiwan。

4. 鍍製光學硬膜之封閉式高能磁控濺鍍裝置及其製造方法, Application No.: 105121174, Taiwan。



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● Technology introduction

In this increasingly material-dominated environment, the key to further cost reduction is improved energy conversion efficiency, with the fullest possible gains in this area possible by the tandem cell approach described in the present application. This approach furthermore builds on the dramatic cost reductions demonstrated in the other parts of the silicon photovoltaic value chain. The virtual Ge substrate can be used for interconnecting the silicon cell with the overlying III-V cells. Alternatively, the structure offers prospects for innovative device design by taking advantage of the possibility of current sharing between the SiGe and Si devices.

● Development

Spin-off:

1. Founded the Progression Optics Co., Ltd. on 2017/10/30 with a capital of NT \$ 1 million. Primary service: Virtual Ge substrate technology & Optical thin film design and manufacturing.
2. Founded the Adolite Cayman Inc. on 2017/08/08 with a capital of US \$ 100 million, working capital of NT\$ 7,000,000 in Taiwan. Primary service: SiGe optical sensor

Technology transfer

Technology name: <Magnetron Pulse Sputtering Deposition> · contract sum = NT \$ 1 million. The progression optics company will transfer technology with national central university in January 2018.