

## 實驗室簡介內容

**實驗室名稱：**綠能奈米科技實驗室

Green Energy Nano Technology Lab.

**實驗室地點：**S309

**負責教師：**吳建宏 Chien Hung Wu

**簡介：**

本實驗從 2010 年成立以來朝向光電半導體技術開發與系統整合的研究方向，並執行科技部計畫及服務產業及研究機構的產學合作計畫。

**主要研究主題：**

- (1) 大氣常壓電漿製作出的 IGZO 薄膜電晶體
- (2) 248 nm 波長準分子雷射退火
- (3) 高介電系數材料(氧化鋁/二氧化鈦)薄膜與大氣電漿沉積氧化銦鎵鋅薄膜電晶體特性與可靠度之研究
- (4) 微波系統退火技術
- (5) 太陽能元件量測與特性改善

**設備：**

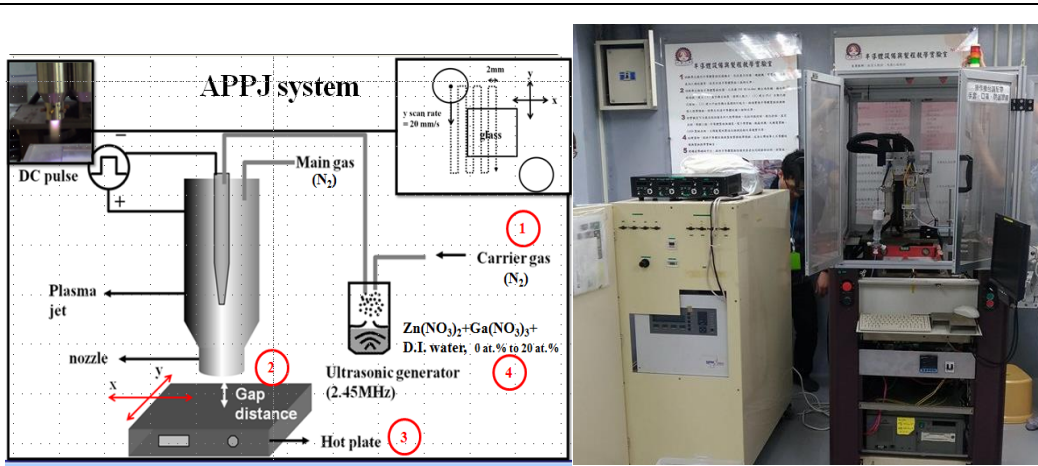


圖 1. 大氣電漿噴塗系統

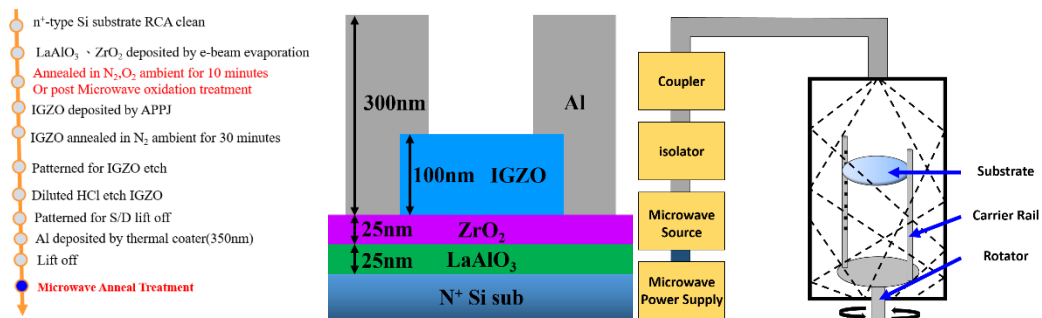


圖 2. 本研究團隊針對微波退火系統於 IGZO 元件架構與製程流程圖

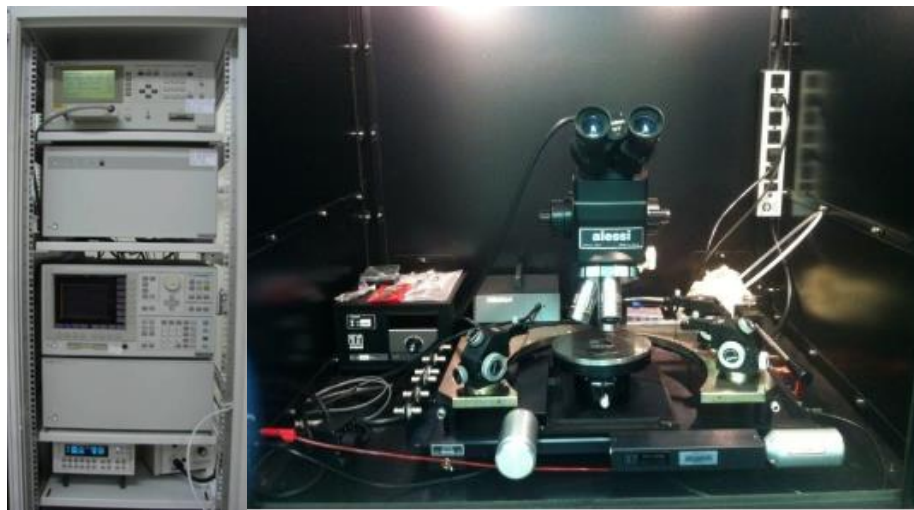


圖 3. 本研究團隊之量測設備儀器

研究方向與成果發表：

- (1) Chien-Hung Wu, Kow-Ming Chang, Shin-Yu Yao, Yu -Xin Zhang, Yi-Ming Chen, Shih-Ho Chang, "Investigation of High Performance P-

type SnO<sub>x</sub> Thin-film Transistor with Microwave Annealing in Oxygen Ambient” *The 2017 International Electron Devices and Materials Symposium*, Sep (2017).

(2) Kow-Ming Chang, Bo-Wen Huang, Chien-Hung Wu, Hsin-Ying Chen, You-Xian Zheng, Ming-Chuan Lee, Yu-Xin Zhang, Chuang-Ju Lin, Yu-Hsuan Cheng, Shui-Jinn Wang, Jui-Mei Hsu, Yu-Li Lin, “The Investigation for In-Ga-Zn-O TFTs with post deposition of in-situ Ar/H<sub>2</sub> plasma treatment by atmospheric pressure plasma jet” *2016 IEEE 16<sup>th</sup> International Conference on Nanotechnology*, Nov (2016).

(3) Chien-Hung Wu, Bo-Wen Huang, Kow-Ming Chang, Shui-Jinn Wang, Jian-Hong Lin, Jui-Mei Hsu, “The Performance Improvement of N<sub>2</sub> Plasma Treatment on ZrO<sub>2</sub> Gate Dielectric Thin-Film Transistors with Atmospheric Pressure Plasma-Enhanced Chemical Vapor Deposition IGZO Channel” *Journal of Nanoscience and Nanotechnology*, Vol. 16, no. 6, pp. 6044-6048, June (2016).

( SCI=1.556 ) (通訊作者)

(4) Chien-Hung Wu, Kow-Ming Chang, Kuang-Jen Lai, Yi-Ming Chen, Kai-Chien Tsai, and Ing-Jar Hsieh, “Properties of SnO<sub>x</sub> in p-type Thin-film Transistor with Furnace Annealing in Nitrogen and Oxygen

Ambient" *The 2016 International Electron Devices and Materials Symposium*, Taipei, Taiwan, Nov. 24-25 (2016).

- (5) Chien-Hung Wu, Kow-Ming Chang, Yi-Ming Chen, Bo-Wen Huang, Yu-Xin Zhang, Shui-Jinn Wang, and Jui-Mei Hsu, "The Investigation of Gate-Stacked In-Ga-Zn-O TFTs with Ga-Zn-O Source/Drain Electrodes by Atmospheric Pressure Plasma-Enhanced Chemical Vapor Deposition" *The 14th International Conference on Nano Science and Nano Technology*, Mokpo, Korea, Nov. 10-11 (2016).
- (6) Chien-Hung Wu, Kow-Ming Chang, Yu-Xin Zhang, Bo-Wen Huang, Yi-Ming Chen, and Shui-Jinn Wang, "Using KrF ELA to Improve Gate-Stacked LaAlO<sub>3</sub>/ZrO<sub>2</sub> IGZO-TFTs with Novel AP-PECVD Technique" *The 14th International Conference on Nano Science and Nano Technology*, Mokpo, Korea, Nov. 10-11 (2016).
- (7) Chien-Hung Wu, Bo-Wen Huang, Kow-Ming Chang, Yao-Jen Lee, Jian-Hong Lin, and Jui-Mei Hsu, "Investigation of Positive Bias Stress for Microwave Annealing Assisted In-Ga-Zn-O Thin Film Transistors with AP-PECVD Technique" *The 12th International Thin Film Transistor Conference*, Hsinchu, Taiwan, Feb. 25-26 (2016)
- (8) Chien-Hung Wu, Bo-Wen Huang, Kow-Ming Chang, Ting-Chia Chang, and Shui-Jinn Wang, "Bias Temperature Instabilities for

High- $\kappa$  HfO<sub>2</sub> LTPS-TFTs with Dual Plasma Treatment," *IEEE/OSA Journal of Display Technology*, Vol. 12, no. 3, pp. 232-239, March (2016). ( [SCI=1.925](#) ) (通訊作者)

(9) Kow-Ming Chang, Bo-Wen Huang, Chien-Hung Wu, I-Chung Deng, Ting-Chia Chang, and Sheng-Chia Lin, "Using Dual Plasma Treatment to Improve Electrical Characteristics and Reduce Flicker Noise of High- $\kappa$  HfO<sub>2</sub> LTPS-TFTs," *Solid-State Electronics*, Vol. 111, pp. 7-11, March (2015). ( [SCI=1.504](#) ) (通訊作者)

(10) Tu, Yung-Chun; Wang, Shui-Jinn; Wu, Chien-Hung; Chang, Kow-Ming; Lin, Tseng-Hsing; Hung, Chien-Hsiung; Wu, Jhen-Siang, "Improving Crystalline Silicon Solar Cell Efficiency Using Graded-Refractive-Index SiON/ZnO Nanostructures," *INTERNATIONAL JOURNAL OF PHOTOENERGY*, Vol. 2015, Article ID 275697, 6 pages, (2015). ( [SCI=1.226](#) )

(11) Chien-Hung Wu, Bo-Wen Huang, Kow-Ming Chang, and Shui-Jinn Wang, "The Performance Improvement of LaAlO<sub>3</sub>/ZrO<sub>2</sub>/IGZO-TFTs with AP-PECVD by KrF Excimer Laser Annealing" *The 28th International Microprocesses and Nanotechnology Conference*, Toyama, Japan, Nov. 10-13 (2015).

(12) Chien-Hung Wu, Bo-Wen Huang, Kow-Ming Chang, and Shui-Jinn

Wang, "Temperature Effect of Double Gate-Stacked Layer ZrO<sub>2</sub>/LaAlO<sub>3</sub> IGZO Thin-Film Transistors Prepared by AP-PECVD" , *The 2nd International Conference on Innovation Trends in Multidisciplinary Academic Research*, Istanbul, Turkey, Oct. 20-21 (2015).

(13) Chien-Hung Wu, Bo-Wen Huang, Kow-Ming Chang, Ting-Chia Chang, Sheng-Chia Lin, Jian-Hong Lin, and Shui-Jinn Wang, "Novel Reliability Mechanism of Quasi Reaction-Diffusion Model for PBTI in n-channel HfO<sub>2</sub> LTPS-TFTs with Dual Plasma Treatment" *The 11th International Thin Film Transistor Conference*, Rennes, France, Feb. 27-28 (2015). (通訊作者)

(14) Chien Hung Wu, Hau Yuan Huang, Shui Jinn Wang, and Kow Ming Chang, "High-Mobility InGaZnO TFTs Using Atmospheric Pressure Plasma Jet Technique and 248-nm Excimer Laser Annealing" , *IEEE Electron Device Letters*, Vol. 35, No. 10, pp. 1031-1033, (2014) ( SCI=2.825 ) (通訊作者)

(15) Chien-Hung Wu, Kow-Ming Chang, and Hsin-Yu Hsu, "High Performance HfO<sub>2</sub>/ZrO<sub>2</sub>/IGZO Thin-Film Transistors Deposited Using Atmospheric Pressure Plasma Jet" , *IET Electronics Letters*, Vol. 50, Issue 23, pp. 1747 – 1749, (2014) (SCI=1.038) (通訊作者)

- (16) Chien-Hung Wu, Hau-Yuan Huang, Shui-Jinn Wang, Kow-Ming Chang, Hsin-Yu Hsu, "Investigation of LaAlO<sub>3</sub>/ZrO<sub>2</sub>/a-InGaZnO thin-film transistors using atmospheric pressure plasma jet" , *IET Electronics Letters*, Vol. 50, Issue 9, pp. 706 – 708, (2014) (SCI=1.038)  
(通訊作者)
- (17) Hau-Yuan Huang, Shui-Jinn Wang, Chien-Hung Wu, and Chien-Yuan Lu, "Improvement of Electrical Performance of InGaZnO/HfSiO TFTs with 248-nm Excimer Laser Annealing" , *Electronic Materials Letters*, Vol. 10, No.5, pp. 899-902, (2014)  
(SCI=3.977)
- (18) H. Y. Huang, S. J. Wang, C. H. Hung, C. H. Wu, and W. C. Lin, " InGaZnO metal-base transistor with high current gain" , *IET Electronics Letters*, Vol. 50, Issue 20, pp.1465-1467, (2014)  
(SCI=1.038)
- (19) Hau-Yuan Huang, Shui-Jinn Wang, Chien-Hung Wu, Chen-Kuo Chiang, and Je-Yi Su, " Performance tuning of InGaZnO thin-film transistors with a SnInGaZnO electron barrier layer" , *Applied Physics Letters*, 102, 092108 (2013) ( SCI=3.844 )