出國報告（出國類別：其他：國際會議）

第三屆基礎及應用科學國際研討會
The 3rd International Symposium on Fundamental and Applied Sciences

服務機關：國立雲林科技大學
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摘要

本次參加國際研討會，投稿文章主要研究是由研究生何昇達的研究為主，其研究特徵摘要如后:製備一個光電化學電池(photoelectrochemical cell, PEC)，結構以修飾矽奈米線(silicon nanowire, SiNW)為陽極，鉑為陰極，電解液為 K_2SO_4、H_2SO_4(pH=1)。首先將 p-type 矽晶片浸泡於氫氟酸(HF)和硝酸銀($AgNO_3$)溶液蝕刻形成矽奈米線，再將鉑奈米顆粒(Pt nanoparticle, NPs)和二硫化鉬奈米顆粒(MoS_2 nanoparticles)沉積於矽奈米線表面上。修飾的陽極以掃描式電子顯微鏡觀察表面及橫截面圖，穿透式電子顯微鏡其觀察型態及結構。製備的光電化學電池利用日光模擬儀光源 AM1.5 照射下(100mW/cm^2)測量電流密度及交流阻抗分析。結果表明光電化學裝置在標準氫電極下陰極電壓 0mV 和 200mV 時分別最好之電流密度達-7.21 mA/cm^{2}及 -14.3mA/cm^2。未來在氫燃料電池的應用有很大的助益。

目次

一、目的

為增加研究團隊研發能力及國際視野，本研究主持人陳文照教授的指導與鼓勵下，成功投稿國際研討會，第三屆基礎及應用科學國際研討會(The 3rd International Symposium on Fundamental and Applied S(ISFAS))。本次研討會集合International Conference on Business and Social Sciences，International Symposium on Education, Psychology, Society and Tourism，Annual Conference on Engineering and Information Technology，International Symposium on Fundamental and Applied Sciences，及Asia-Pacific Teaching Professor Conference等5個團體共同舉辦，在日本大阪國際交流中心舉行。

二、過程

團隊3/21 8:30從桃園中正機場出發，於日本關西機場降落，轉搭南海鐵路到大阪住處，時間已是日落。研討會從3/22至3/24為期3天，大會議程安排分專題演講、口頭報告與海報展示，3/22早上辦理報到，報到當天也有許多來自台灣的研究團隊，報到處亦安排日本當地特色和服供與會者試穿拍照，如附圖(一)，增加不少熱鬧氣氛。由於有5個不同類型研討會合辦，場地有限，我們被安排在第3 天3/24下午海報展演，海報如附圖(二) ，當天即參加幾個場次有關科技類的口頭報告，瞭解其他研究團對研究石墨烯及二硫化鉬的應用趨勢。

三、心得

首先感謝國立雲林科技大學人文與科學學院補助教師出席國際研討會，第三屆基礎及應用科學國際研討會(The 3rd International Symposium on Fundamental and Applied S(ISFAS))及國科會計畫對於研究計畫的經費補助和支持。對老師及學生來說，參加國際研討會，除了吸收世界各地優秀學者所提供的研究資訊之外，對於磨練外語能力以及人際關係的溝通也是個重點，希望往後有更多的機會可以參與國際研討會。也希望藉由參與國際上的學術研討會，能夠提升研究團隊的研究

水準，並提高本校在國際學術研究上的能見度，在此要特別感謝國立雲林科技大學人文與科學學院對於本次出國參加研討會提供的機票方面補助與支持。

四、附錄

圖(一) 研討會報到

圖(二)研討會海報

Highly efficient photoelectrochemical hydrogen generation using a Pt-MoS_2/Si nanowire array

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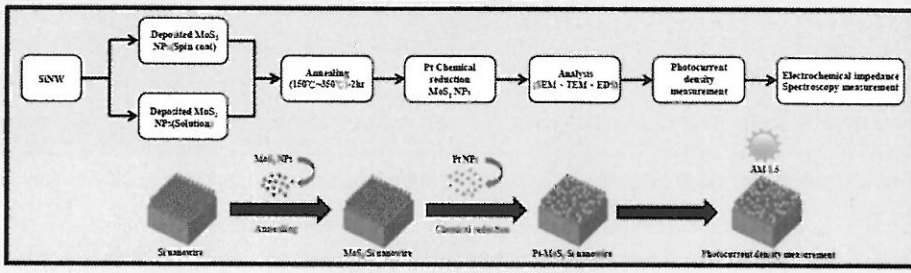
Introduction

A photoelectrochemical solar cell with a structure of modified Si nanowire anode/ K_2SO_4, H_2SO_4 (pH=1)/Pt cathode was prepared and studied. The Si nanowires were first formed by immersing p-Si chip in an etching solution of HF + $AgNO_3$. The solutions of MoS_2 are obtained by solvothermal treating $(NH_4)_2MoS_4$ in the mixture of N,N-Dimethylformamide (DMF) and H_2O. The MoS_2 was deposited on the surface of Si nanowires by dipping and coating methods. The Si nanowire deposited with MoS_2 (MoS_2/SiNW) was annealed in a N_2 furnace at 150 - 350 °C for 2 h. The Pt/ MoS_2/SiNW was prepared by polyol process. H_2PtCl_6 $6H_2O$ and the as-obtained MoS_2/SiNW were added to ethylene glycol (50 mL) and reflux at 120 - 150 °C for 6 hours. The modified anode was characterized by a scanning electron microscope for the surface and cross section view, and by transmission electron microscope for the phase and structure. The properties of the photoelectrochemical solar cell were measured under standard AM 1.5 simulated sunlight (100mW / cm^2).

Experimental



Results and discussion

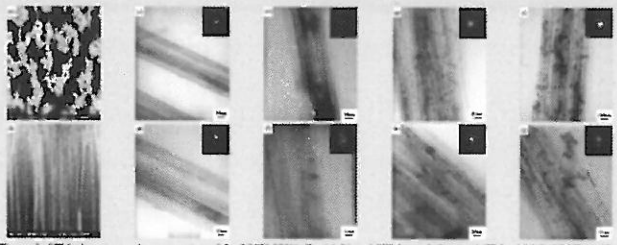


Figure 1. SEM plan view and cross section of Pt /SiNW 120℃-3hr (a),(b) and TEM morphology and EDS of MoS_2/SiNW (c),(d) Solution 200℃-2hr (e),(f) Spin Coat 150℃-2hr and Pt-MoS_2/SiNW (g),(h) Solution 200℃-2hr/Pt 120℃-3hr (i),(j) Spin Coat 250℃-2hr/Pt 120℃-3hr

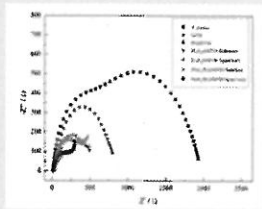


Figure 2. Electrochemical impedance spectroscopy measurements of Pt-MoS_2/SiNW in H_2SO_4 and 0.5 M K_2SO_4 (pH 1) under simulated solar light

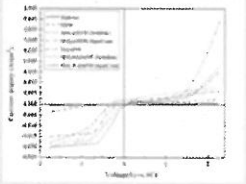


Figure 3. Photocurrent-voltage measurements range -1.75V~2.5V of Pt-MoS_2/SiNW in H_2SO_4 and 0.5 M K_2SO_4 (pH 1) under simulated solar light

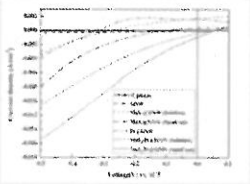


Figure 4. Photocurrent-voltage measurements range -0.5V~1.0V of Pt-MoS_2/SiNW in H_2SO_4 and 0.5 M K_2SO_4 (pH 1) under simulated solar light

Parameter / Potential	-0.2V	0V
Si Planar	-0.064mA/cm²	-0.045mA/cm²
SiNW	-0.34mA/cm²	-0.23mA/cm²
MoS_2 @SiNW(Solution)	-8.14 mA/cm²	1.12 mA/cm²
MoS_2 @SiNW(Spin Coat)	-6.83 mA/cm²	-1.45 mA/cm²
Pt @SiNW	-2.98 mA/cm²	1.53 mA/cm²
MoS_2 Pt @SiNW(Solution)	-8.76 mA/cm²	-4.38 mA/cm²
MoS_2 Pt @SiNW(Spin Coat)	-14.3 mA/cm²	-7.21 mA/cm²

Table I. Photocurrent-voltage data of Pt-MoS_2/SiNW in H_2SO_4 and 0.5 M K_2SO_4 (pH 1) under simulated solar light

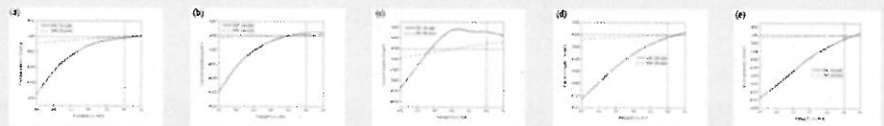


Figure 6. Dark current and photo-current measurements of Pt-MoS_2/SiNW (a) Solution 200℃-2hr (b) Spin Coat 150℃-2hr (c) Pt 120℃-3hr (d) Solution 200℃-2hr/Pt 120℃-3hr (e) Spin Coat 250℃-2hr/Pt 120℃-3hr in H_2SO_4 and 0.5 M K_2SO_4 (pH 1)