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Novel Ternary Nanoheterostructures for Photoelectrochemical Cells

Organised by:
UPM Universiti Putra Malaysia
Institut Nanosains dan Nanoteknologi
Institute of Nanoscience and Nanotechnology

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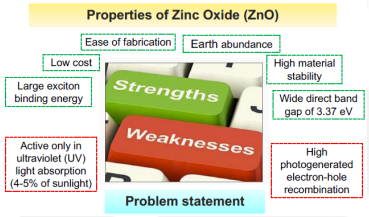
INTRODUCTION

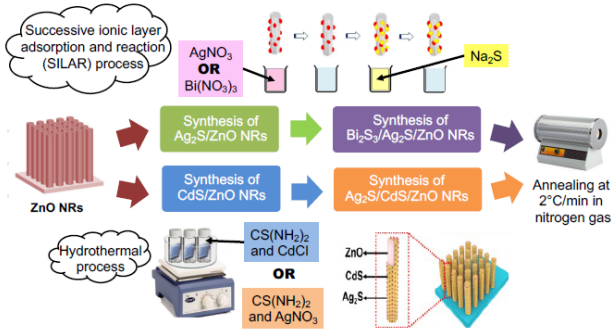
A huge number of materials have been reported for solar energy applications which reveal a clean and low-cost solution to the sustainable and renewable energy quest. In fact, the photoelectrochemical (PEC) cell constructed with zinc oxide (ZnO)-based photoanode is regarded as one of the most favorable protocols for solar-to-chemical energy conversion.



Objective:

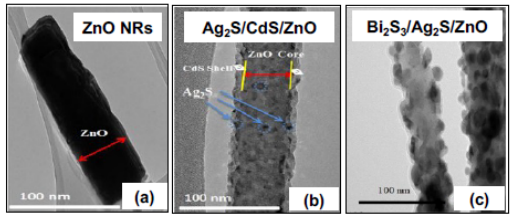
To enhance the photoelectrochemical efficiency of ZnO nanorods (NRs) by loading narrow band metal sulfide chalcogenides (such as Ag_2S, CdS, and Bi_2S_3), forming a stable ternary nanoheterostructured photoelectrode.

MATERIALS & METHODS

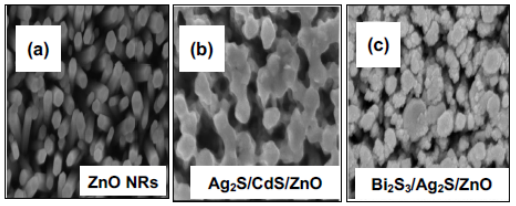


RESULTS & DISCUSSION

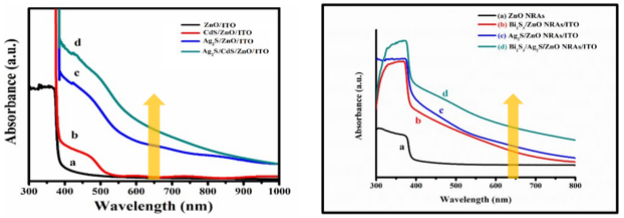
HRTEM analysis



FESEM analysis

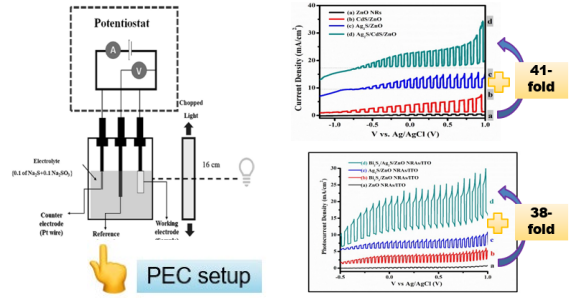


Optical properties



Sample	Band gap, eV	Sample	Band gap, eV	Sample	Band gap, eV
ZnO NRs	3.15 – 3.22	Ag_2S/CdS/ZnO	1.50	Bi_2S_3/Ag_2S/ZnO	1.60

Photoelectrochemical measurement



CONCLUSION

- Two novel ternary Ag_2S/CdS/ZnO NRs and Bi_2S_3/Ag_2S/ZnO NRs photoelectrodes were successfully fabricated *via* facile hydrothermal and SILAR techniques.
- The measured photoelectrochemical current density was greatly enhanced from 0.37 mA/cm² for pristine ZnO NRs to 15.27 mA/cm² for Ag_2S/CdS/ZnO NRs and 12.95 mA/cm² for Bi_2S_3/Ag_2S/ZnO NRs.
- Ag_2S/CdS/ZnO NRs and Bi_2S_3/Ag_2S/ZnO NRs achieved the highest photoconversion efficiency (PCE) of 15.27% and respectively (12.95%).

ACKNOWLEDGEMENTS

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Zulkarnain Zainal (Prof. ChM. Dr.),
Department of Chemistry,
Faculty of Science,
Universiti Putra Malaysia,
43400 Serdang, Selangor
Tel : +603-9769 6810
Email : zulkar@upm.edu.my