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Development of perovskite nanostructured thin films using water soluble lead precursors and its application on solar cells

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Statement of the Problem: Due to the limitation in natural energy resources and the growing concern for environmental protection, alternative power generation technologies have become very important. The perovskite structures have been research subjects for photoluminescence, electroluminescence and catalyst applications. The objective of this study has been to develop less toxic, water-based processes for high efficiency perovskite solar cells. It is therefore essential to design and match the energy levels and interfacial characteristics between the perovskite sensitizers and the contact metal layers.

Methodology & Theoretical Orientation: Fluorine-tin oxide-coated glass substrate was cleaned, then surface-treated with plasma and UV light irradiation to increase its hydrophilicity. The electron-transport layer composed of titanium dioxide dense layer and then a mesoporous layer was spin-coated and further annealed. A precursor solution of lead nitrate was used to plate lead dioxide film which was immersed in MAI to create the $MAPbI_3$ perovskite nanostructured thin film. Spiro-OMeTAD was used as the hole-transport layer and silver was applied as the cathode.

Conclusion & Significance: Since developing less toxic, water-based precursor formulation it has been encouraging to find better deposition method for lead precursor, thus the perovskite nanostructure. After the parameters have been optimized, long time stability characterization could be carried out for the new high efficient perovskite solar cells.

Biography

G M Wu has completed his PhD from the University of Delaware, USA and had been a Visiting Professor at the University of California at Los Angeles, USA. He is In-charge of the Electro-Optical Engineering Laboratory of Chang Gung University in Taiwan. He has published more than 50 papers in reputed journals and served as technical consultant for a broad range of industrial companies. This study was supported in part by the Ministry of Science and Technology under research grants MOST105-2221-E182-059-MY3 and NERPD2E0481.

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