Electric Characteristic Analysis for Photoelectric Thin Films and devices

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The efficiency of low temperature silicon thin film solar cell is still lower than single crystallization solar cell. Most of the efficiency loss comes from bulk traps, interface traps, and light induced degradation. In recent year, most researches developed the window layer with higher energy band gap and conductive micro- Silicon to improve the efficiency of thin film, but discontinued energy gaps of different layer increase the influence of interface traps and decrease the efficiency of solar cells. The characteristic analysis and efficiency influenced by the thin film trap states in thin film solar cells will be discussed. Higher cell efficiency can be obtained by optimizing the trap state distribution in silicon thin film solar cell. Different analysis methods such as voltage-capacitance and activation energy are used to analyze the trap states in every layer. By using different wavelengths of LED light, the physical operation of the device is proposed. Furthermore, through simulation software, light-induced current in the device under various wavelength of light is calculated and compared to the experimental value to verify the proposed physical operation. From the obtained results, process parameters can be modified to optimize the quality of thin film and trap states.