FABRICATION OF A THIN FILM SOLAR CELLS USING LAYER BY LAYER (LBL) NANOASSEMBLY OF COPPER INDIUM GALLUIM SELENIUM (CIGS) NANOPARTICLES

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Copper Indium Gallium Selenium (CIGS), a p-type semiconductor material with a tunable band gap, has been broadly studied for high efficiency solar cells as a viable sustainable energy source. Production of CIGS nanoparticles gives the ability of fabricating thin, light, and flexible solar cells. However, the current fabrication technologies of such devices are still very costly. This poster presents the synthesis and functionalization of CIGS nanoparticles and proposes Layer-by-Layer (LbL) nanoassembly process, as a low cost method, to fabricate thin films for solar cell applications. The results show that the synthesized CIGS particles have 1.3 ev band gap and 30 nm diameter in average. These particles were later coated with polymers to provide alternative opposite surface charges suitable for LbL process. Deposition of 20 layers of the particles on indium tinoxide (ITO) coated glass formed a thin film with 220 nm thickness. The measured current voltage (I-V) characteristic of the film gave resistivity of 7.9 MΩ.m in dark and 2.25 MΩ.m under light illumination. A prototype solar cell made out of the film resulted in short circuit current density (J_{SC}) of 0.3 mA/cm^2 and open circuit voltage (V_{OC}) of 0.7 V.

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