# SYNTHESIS AND FUNCTIONALIZATION OF CIGS NANOPARTICLES FOR LBL DEPOSITION

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Copper Indium Gallium Diselenide (CIGS) solar cells have been used widely in thin film solar cells due to their high attainable efficiency and tunable band gap. The cost of solar cell manufacturing needs to be further reduced to make CIGS solar cells economically viable. The main objective of this research is to repeatedly and accurately synthesize CIGS nanoparticles in a desired ratio to allow for an efficient band gap and dispersion in an aqueous solution for Layer-by-Layer (LbL) nanoassembly. CIGS nanoparticles have been synthesized by arrested precipitation in Oleylamine solution. The particles were purified utilizing chloroform, ethanol, and water via centrifugation. The purified nanoparticles were down to a size of 15 nm with average size of 60 nm. A ligand exchange was performed to remove the capping agent, Oleylamine, and replace it with 11-mercaptoundecanoic acid, a thiol ligand. The thiol ligand used had charged functional groups resulting in the functionalized particles with expected high negative zeta potential for stable dispersion. Lastly, the nanoparticles were analyzed through the utilization of X-ray diffractive spectroscopy (XRD), transmittance spectroscopy, energy-dispersive x-ray spectroscopy (EDS) and a scanning electron microscope (SEM). Using the oppositely charged dispersion in aqueous solutions, multiple size-controlled layers of CIGS can be obtained using Layer-by-Layer nanoassembly, creating a solar cell. The synthesis, characterization and functionalization results will be presented in the poster.

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This study was sponsored by the Indiana University-Purdue University Indianapolis Undergraduate Opportunity Program (UROP) and supported by Integrated Nanosystems Development Institute (INDI).