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Characterization of $CuInSe_2$/CdS thin-film photovoltaics by x-ray photoelectron spectroscopy

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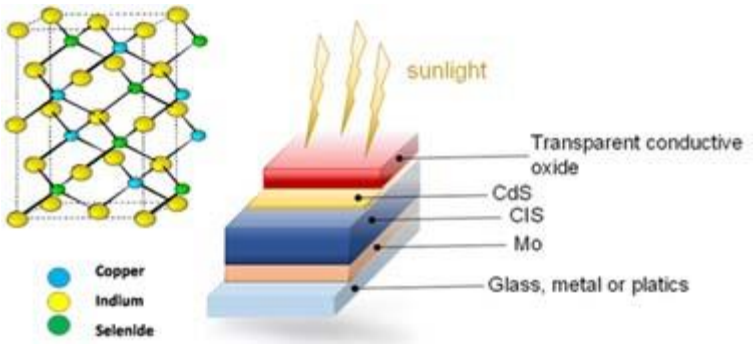
Abstract

CuInSe2/CdS are promising photovoltaic materials due to their low production costs, chemical flexibility, and their acceptable conversion efficiencies. Although basic understanding of the device performance in terms of charge collection and recombination mechanism(s) are identified, there is still room for better understanding the effects of various defects and imperfections on device performance. X-Ray Photoelectron Spectroscopy has long been utilized for investigating nature of the chemical and physical parameters effecting the performance of these materials and devices made out of them. One particular advantage of XPS is its ability to identify and quantify charge accumulation and/or depletion through analysis of the shifts in the binding energy of the elemental peaks as a result of the local electrical potentials developed, since the kinetic energy of the photoelectrons emitted is directly influenced by them. This work focuses on measuring the photo-shifts individually for Cd, In and Cu via illumination by lasers with three different colors towards assessing the presence and the effect of atomic defects and/or imperfections.



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