

**Area: Area2, Thin-Film Compound Semiconductor PV**

**Characterization of the  $\text{Cu}_2\text{ZnSn}(\text{S}_x\text{Se}_{1-x})_4$ (CZTSSe) absorber thin films deposited by a sputtering process**

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$\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$  thin film solar cells have been fabricated using sputtered Cu/Sn/Zn metallic precursors on Mo coated sodalime glass (Mo-SLG) substrate without using a toxic  $\text{H}_2\text{Se}$  and  $\text{H}_2\text{S}$  atmosphere. The As-deposited metallic precursors were sulfo-selenized in graphite box containing S and Se powder using rapid thermal annealing (RTA) furnace. Thin film solar cells were fabricated after sulfo-selenization process using a 25 nm CdS buffer layer, a 100 nm intrinsic ZnO, a 600 nm Al doped ZnO, and Al/Ni top metal contact. The Effect of annealing process pressure and CdS buffer layer thickness on the morphological, structural and electrical properties have been studied using field emission scanning electron microscopy (FESEM), X-ray diffraction (XRD), Raman spectroscopy, I-V and quantum efficiency measurement system, and time resolved photoluminescence spectroscopy, respectively. The fabricated  $\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$  thin film solar cell shows the best conversion efficiency of 11.80% ( $V_{oc}$  : 484.6 mV,  $J_{sc}$  : 37.50 mA/cm<sup>2</sup>, FF : 64.91%, and active area : 0.3 cm<sup>2</sup>), which is the highest efficiency among  $\text{Cu}_2\text{ZnSn}(\text{S,Se})_4$  thin film solar cells prepared using sputter deposited metallic precursors. Details about other experimental results will be discussed during the presentation.