

### Growth of CuInSe<sub>2</sub> Thin Film Using Non-Vacuum Solution Deposition Technique

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Polycrystalline thin films of CuInSe<sub>2</sub> were prepared successfully using the chemical spray pyrolysis technique as a function of Cu/In atomic ratios and variation of selenium ratios. For the compositional and structural analysis, X-ray diffraction, UV-visible spectroscopy, the Hall effect measurement and scanning electron microscopy were carried out. The effects of the Cu/In ratio and selenium concentration were observed in the XRD, SEM, UV-visible spectrum and the Hall effect measurement analysis for fabricated thin films. The result of XRD and UV-visible analysis showed an increase or decrease of crystallinity and shift of transmittance tendency depending on the copper and selenium content. The grain size of thin films was increased with the increase of copper content. In the thin films, the variation of Cu/In ratios between 0.8 to 1 showed an increase on hole density, but a decrease of Hall mobility and resistivity. We suggest the formation of Cu<sub>x</sub>Se phase particles or layers depends on the spray solution. Based on these results, we will fabricate and characterize CIGSe thin film solar cells in further work.