

## Aerosol Jet Deposition of $\text{CuInS}_2$ Thin Films

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Among the semiconductor ternary compounds in the I-III-VI<sub>2</sub> series,  $\text{CuInS}_2$  ( $\text{CuInSe}_2$ ) are one of the promising materials for photovoltaic applications because of the suitability of their electrical and optical properties. The  $\text{CuInS}_2$  thin film is one of I-III-VI<sub>2</sub> type semiconductors, which crystallizes in the chalcopyrite structure. Its direct band gap of 1.5 eV, high absorption coefficient and environmental viewpoint that  $\text{CuInS}_2$  does not contain any toxic constituents make it suitable for terrestrial photovoltaic applications.

A variety of techniques have been applied to deposit  $\text{CuInS}_2$  thin films, such as single/double source evaporation, coevaporation, rf sputtering, chemical vapor deposition and chemical spray pyrolysis. This is the first report that  $\text{CuInS}_2$  thin films have been prepared by Aerosol Jet Deposition (AJD) technique which is a novel and attractive method because thin films with high deposition rate can be grown at very low cost.

In this study,  $\text{CuInS}_2$  thin films have been prepared by Aerosol Jet Deposition (AJD) method which employs a nozzle expansion. The mixed fluid is expanded through the nozzle into the chamber evacuated in a lower pressure to deposit  $\text{CuInS}_2$  films on Mo coated glass substrate. In this AJD system, the characteristics of  $\text{CuInS}_2$  films are dependent on various deposition parameters, such as compositional ratio of precursor solution, flow rate of carrier gas, stagnation pressure, substrate temperature, nozzle shape, nozzle size and chamber pressure, etc. In this report,  $\text{CuInS}_2$  thin films are deposited using the deposition parameters such as the compositional ratio of the precursor solution and the substrate temperature. The deposited  $\text{CuInS}_2$  thin films will be analyzed in terms of deposition rate, crystal structure, and optical properties.

**Keywords:**  $\text{CuInS}_2$ , thin film, expansion, AJD