Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Ratio of Cu, Zn, Sn and S densities in magnetron sputtering plasmas employing a stoichiometric Cu_2ZnSnS_4 target NAYAN NAFARIZAL, Hokkaido University & Universiti Tun Hussein Onn Malaysia, KOICHI SASAKI, Hokkaido University — Recently, Cu_2ZnSnS_4 (CZTS) has drawn wide attention as a highly potential material for the next-generation thin film solar cells. In order to optimize CZTS thin films for solar cells, it is essential to understand their deposition mechanism. Especially since it consists of four elements, it is difficult to control the stoichiometric properties. In the present work, we measured the absolute ground-state densities of Cu, Zn, Sn, and S atoms released from a stoichiometric CZTS target in magnetron sputtering plasmas. The absolute atom densities were evaluated by ultraviolet and vacuum ultraviolet absorption spectroscopy. Magnetron sputtering plasmas were produced using a pulsed-modulated rf power supply and the temporal variations of atom densities were measured in the afterglow. The absolute Cu, Zn, Sn and S densities in the discharge phase were evaluated by the extrapolations of the temporal variations. It has been observed that the absolute Cu, Zn, Sn and S densities in the gas phase were not in agreement with the stoichiometry of the target as well as that of the deposited film. The results suggest possibilities of unconventional sputtering and deposition processes in the compound sputter deposition.

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Date submitted: 16 Jun 2015 Electronic form version 1.4