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Composition ratio and structural analysis according to Se injection method in heat treatment process after CIGS single target sputtering

In this study, after CIGS sputtering using a single target, Se was supplied in various ways during heat treatment to analyze composition ratio and structural characteristics of the thin film. The thin films were deposited by DC sputtering and heat treatment process during selenization. Thin films were analyzed with SEM, EDS, XRD. The pressure was set to 2~6 mTorr as a process variable, the power was set to 60~200 W, and the heat treatment temperature was varied from 150~550 ℃. At a process pressure of 4 mTorr, large crystals and uniform thin films were formed and high deposition rate, high crystallinity and density were observed at 200 W power. After depositing the thin film at 4 mTorr and 200 W, the peak value increased from 550 ℃ when the heat treatment step progressed, showing the preferred orientation. However, to compensate the loss of Se when the heat treatment process preceded, the heat treatment was performed at the same time as the Se supply. As a result, it was confirmed that the composition ratio of Se was increased from 0.81 to 0.86 as shown: Cu=0.91, Ga=0.24 and Se=0.86 from Cu=0.84, Ga=0.22 and Se=0.81. In addition, SEM analysis showed that the grain size became larger and the surface was rough but uniform, and the grain boundaries were clearly visible. As a result of XRD analysis, the orientation of the chalcopyrite structure increased in the crystal orientation when Se was supplied and heat treatment was carried out.

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