Annealing Effects of Sputtered Cu_2ZnSnS_4 Solar Cells

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Recently, the chalcogenide-based compound Cu_2ZnSnS_4 is considered as one of the ideal photovoltaic absorber materials of thin film solar cells. The optimization of thin film solar cells depends on minimizing current and voltage losses across the devices. In this work, we investigated the effects of CdS buffer layer and ZnO:Al window layer annealing processes on sputtered CZTS solar cell. CZTS solar cell device structure consisted of soda lime glass/Mo/sulfurized CZTS/CdS buffer layer/ZnO:Al window layer/Al grid. After buffer layer and window layer processes, annealing processes applied at 200°C and 300°C with N_2 for 30 minutes respectively. Power conversion efficiency increased from 4.38%(without annealing) to 6.48% for window layer annealed sample at 300°C. The improvement of PV characteristics in annealed samples is possibly related to defect sites numbers and trap energy levels at the interface between absorber and buffer/window layer. Current and voltage losses across the devices can be minimized through the decrease of defect sites numbers and trap energy levels. Thus, it should be expected that the interface state is very important and can be improved by annealing process.