

Properties of Sb_2Se_3 thin films depending on the effect of pre-annealing

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Sb_2Se_3 is one of the alternative absorber materials for thin-film solar cells (TFSCs) comprising non-toxic and low-cost elements. It has an appropriate bandgap of 1.0-1.2 eV and high absorption coefficient ($>10^5 \text{ cm}^{-1}$) [1]. But till date, the efficiencies obtained from the Sb_2Se_3 -based solar cells are relatively low compared to its theoretical limit of ~25% [2]. In order to improve the efficiency, one of the requirements is to improve the crystallinity of Sb_2Se_3 absorber layer.

In our study, the effect of pre-annealing duration at 100 °C prior to rapid thermal annealing (RTA) have been studied. The duration of pre-annealing influences the final morphology, crystallinity, and preferred orientation of thermally evaporated Sb_2Se_3 . Figure 1 shows the change in morphology of the Sb_2Se_3 thin film as the duration of pre-annealing increases from 0 min to 100 min. Further detailed analyses using X-ray diffraction and Raman spectroscopy will be dealt in our presentation.

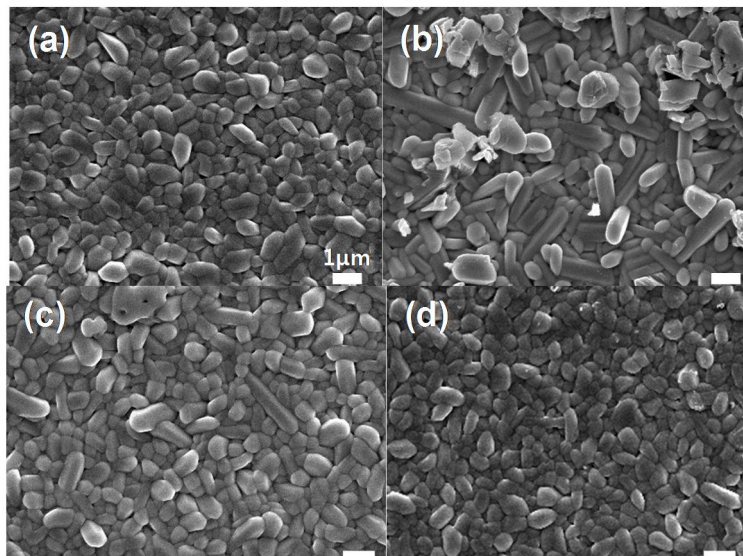


Figure 1. SEM images of the Sb_2Se_3 films experienced different duration of pre-annealing of (a) w/o, (b) 40 min, (c) 60 min, (d) 100 min.

References:

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- [2] M.R. Filip, C.E. Patrick, F. Giustino, *Phys. Rev. B*, **87**, 205125 (2013).