The method of forming a rough thin film by using Sb_2S_3

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Among metal chalcogenides, Sb_2S_3 is appealing as an efficient light absorber because of its suitable properties for adapting solar cells. The deposition methods of Sb_2S_3 light absorber are successive ionic layer adsorption and reaction (SILAR), chemical bath deposition (CBD), and spin coating deposition. Although the SILAR and CBD in aqueous phase can form conformal thin film, it is difficult to avoid the antimony oxide forms so that the Sb_2S_3 light absorber reveals deep traps within bandgap. Therefore, additional healing process is required to convert the antimony oxide to Sb_2S_3 to eliminate/reduce the trap sites. Another problem of CBD method is that it has low reproducibility the Sb_2S_3 layer with same thickness because its thickness is very sensitive to the reaction time and surrounding conditions such as reaction temperature, mixing condition, status of photoanode, and so on. Therefore, it will be useful to develop the deposition method of reproducibly forming the Sb_2S_3 layer with same thickness. In these reason, the spin coating is good candidate to form reproducible Sb_2S_3 thin film. Here, we developed spin coating deposition method by using $Sb(TA)_2Cl_3$ single source precursor which can heal the impure Sb_2S_3 light absorber and control the precise thickness/morphology.