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PHYSICAL PROPERTIES OF CdS ULTRA-THIN FILMS INFLUENCED BY ON-OFF AND THERMOSTATIC CHEMICAL BATH DEPOSITION TECHNIQUE FOR SOLAR CELLS APPLICATIONS

CdS is an n-type semiconductor typically used in CdS/CdTe solar cells as window material due to high optical transparency, wide band gap (2.28-2.50 eV), manipulable thickness less than 100 nm, low temperature deposition process (< 75 °C) and compatibility with several kind of substrates. Usually, CdS is deposited by chemical bath deposition (CBD) technique, which is a simple and inexpensive solution-based process[1]. The chemical reactions are influenced by thermal transfer, in consequence, parameters as deposition time and growth ramp, as well as CdS ultra-thin film physical properties are modified on dependance of temperature indicator controller. An On-Off temperature indicator controller provides a ± 2℃ temperature variation range, with lesser water volume glass-container; while thermostatic temperature indicator controller provides a ± 0.1℃ temperature variation range, with bigger water volume polymer-container. Optimal growth parameters were obtained to control the thickness value in a range from 30 nm to 120 nm on dependance of several applications, including deposition of CdS ultra-thin films window material applied to CdTe solar cells. Moreover, the ability of doping during CdS in-situ CBD process could lead to a potential optimization in device performance and will allow the development of other novel structures, including some ternary compounds. CdS thin films was grown by On-Off and thermostatic chemical bath deposition technique (CBD) on FTO (SnO2:F) substrate at 75℃ with different deposition time. The CdS by in-situ CBD process uses CdCl2 (0.1 M), SC(NH2)2 (0.3 M) as precursor solutions, and NH4Cl (0.2 M), NH4OH (2 M) were used to promote the formation of complex compounds. Comparison of some physical properties was studied, including optical, morphological, and structural properties.

Keywords

CdS, CBD, CdTe solar cells, CdO, thermostatic

Reference

[1] J.M. Flores-Marquez, M.L. Albor-Aguilera, et al, Improving CdS/CdTe thin film solar cell efficiency by optimizing the physical properties of CdS with the application of thermal and chemical treatments, Thin Solid Films 582 (2015) 124-127. http://dx.doi.org/10.1016/j.tsf.2014.10.070

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