Multistage chemical bath deposition of thick film cadmium sulfide for CdS/CdTe X-ray detector

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Abstract

Many methods are used to measure X-ray flux generated by modern X-ray machines. The most common method utilized for monitoring X-ray dose is technically complex and expensive. In this work multilayer of cadmium sulfide (CdS) using chemical bath deposition (CBD) were carried out to deposit thick layer optimum thickness to produce CdS/CdTe junction x-ray detector. The effects of the deposition time, cadmium chloride heat treatment, the ammonia and thiourea concentration on CdS layers were controlled and investigated through scanning electron microscope (SEM), energy dispersive x-ray analysis (EDXA), X-ray diffraction (XRD), and ultraviolet (UV)-visible spectroscopy. The XRD analysis showed that the CdS films have highly oriented crystallites with the classical hexagonal structure (wurtzite type) and the main six diffraction peaks. The relatively stronger and narrow peak of CdS film obtained with 6 stages along (002) plane indicated that the film is highly oriented along the c-axis. The band gap Eg can be extrapolated to be 2.41 eV. It was observed that the maximum and the minimum amplitudes of the pulse formed due to exposed FTO/CdS/CdTe/Mo detector to Xray of 33 keV and 1mA intensity are 0.732 and -0.405 V and consequently the total output amplitude is 1.137 V. Keywords: CdTe; CdS; Thin film; X-ray; Detector