

Elaboration et Caractérisation de Couches Minces SnS

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Abstract: The present work deals with the deposition and characterization of tin sulfide thin film for the photovoltaic application. Films were synthesized by spray pyrolysis technique due to its simplicity and low cost. The starting solutions, were composed of tin chloride (SnCl_2) and thiourea ($\text{CS}(\text{NH}_2)_2$) as a source of Sn and S respectively. Sets of films were prepared by varying four deposition parameters namely deposition time, solvent, spray flow rate and substrate temperature. After preparation films were subjected of various characterizations: structural, morphological, optical and electrical. The structural characterization indicates that SnS films have an orthorhombic structure with a preferential orientation (111) when prepared at low flow rate, high substrate temperature and distilled water as solvent. However, secondary phases such as Sn_2S_3 , SnO_2 and Sn metal are detected in films prepared with methanol as solvent. SEM results indicate the presence of bubbles and craters on the surface of films prepared with methanol, this is due to the sulfur exo-diffusion in form gas of S_2 . The optical studies show that SnS film has a large absorption coefficient in the visible range; the optical gap value is in the order of 1.3eV suggesting that SnS thin films can be a good candidate for thin films solar cells. The electrical measurements indicate that films prepared at high substrate temperature have a large conductivity. The I-V characterization of the two realized SnS/CdS and SnS/ZnS heterostructures reveal a typical behavior of a heterojunction with a good ideality factor; their characteristics are improved after thermal annealing. The Au/SnS/CdS/FTO heterojunction exhibits a photovoltaic effect but with a poor efficiency.

Keywords : Tin sulfide, Spray pyrolysis, Thin films, solar cells.