

SnS THIN FILMS DEPOSITION BY SPRAY PYROLYSIS: SOLVENT INFLUENCE

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Abstract: Tin monosulfide (SnS) films are a new generation of absorber layers for thin film heterojunction solar cell. The goal of the present study is the investigation of the role of the solvent on SnS thin films properties. Films were synthesized by ultrasonic spray pyrolysis technique. The used solution is a mixture of $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$ and thiourea $(\text{SC}(\text{NH}_2)_2)$ precursors prepared with two different solvents: methanol and distilled water. X-ray diffraction (XRD) analysis reveals the SnS orthorhombic polycrystalline phase in different films. Using methanol as solvent leads to Sn_2S_3 secondary phase formation. While, film prepared with distilled water contains SnS_2 as secondary phase. Scanning electron microscopy (SEM) observations reveal that films deposited with the methanol are rough with the presence of craters bubbles on the surface due to gas exo-diffusion during film growth. However, the film deposited with distilled water has a smooth, uniform, homogeneous and pinholes free surface. The electrical measurements reveal that films are p-type semiconductors, the dark conductivity increases from $3.07 \times 10^{-4} (\text{W.cm})^{-1}$ in film prepared with methanol to $5.15 \times 10^{-3} (\text{W.cm})^{-1}$ when using distilled water. We inferred that using distilled water leads to films with better quality than methanol as solvent.

Keywords : Tin monosulfide, Spray pyrolysis, Thin films, solar cells