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Impact of ambient H₂S atmosphere on the growth and properties of vacuum evaporated sulfide semiconductors thin films for device applications

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Thin films of sulfide semiconductor are very important for their efficient use in the fabrication solar cells and optoelectronics devices. The properties of vacuum evaporated thin films of sulfide semiconductors are very sensitive to the deposition conditions. Vacuum thermal evaporation is very simple and inexpensive method which can be used for large area thin film deposition. The problem associated with this technique is to maintain the stoichiometry in the deposition of compound semiconducting materials composed of elements having different vapor pressures. Generally the vacuum deposited thin films of compound sulfide semiconductors have deficiency of sulfur. Such non-stoichiometric films lead to defects in the crystalline structure which, adversely affect the electro-optical properties of the films. Thin films of compound sulfide semiconductors (CdS, ZnS and PbS) have been deposited in a low ambient atmosphere of H₂S by thermal vacuum evaporation technique. Thiourea has been used to create an ambient atmosphere of H₂S inside the vacuum chamber during evaporation. The higher reactivity of H₂S will ensure a better conversion of the dissociated cations (sulfide ions) into compound sulfide semiconductors. The impact of ambient H₂S atmosphere on the growth and properties of vacuum evaporated sulfide thin films have been studied via optical spectroscopy, XRD, SEM, EDX, AFM and XPS measurements. The films grown in H₂S ambient atmosphere are more uniform, more adhesive, pin hole free and have better crystallinity and better adhesion to the substrates and would be inherently more suitable for any electro-optical device fabrication.

Biography

Beer Pal Singh has received his MPhil (1998) and PhD (2002) from C.C.S. University, Meerut (UP), India. He is holding faculty position in Physics at C.C.S. University, Meerut since 2004. Presently, he is working as a visiting scientist (Raman Fellow) in University of Puerto Rico, Mayaguez, PR, USA. He has supervised 6 PhD and more than 20 MPhil students for their research thesis. He has published more than 25 papers in reputed journals and serving as a reviewer of several national/international journal of repute. Recently, he has been nominated as an Editorial Advisory Board Member of Vigyan Pragati published by NISCAIR, New Delhi.

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