

X-RAY DIFFRACTION STUDIES OF In_2S_3 LAYERS DEPOSITED ON POLYAMIDE 6 SURFACES

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The scientific community has shown significant interest in indium sulfide, particularly due to its high photoconductivity, stability, and suitable wide optical bandgap for the fabrication of UV photodetectors [1]. Moreover, the wide bandgap of In_2S_3 enables greater transmission of incident light to the absorber layer, thereby enhancing the short-circuit current [2]. Despite the strong potential of In_2S_3 as a replacement for hazardous CdS, research on indium sulfide thin layers on flexible substrates is still insufficient.

In this study, In_2S_3 thin films were deposited on polyamide 6 via chemical bath deposition (CBD). Polyamide 6 (PA 6) films were boiled in distilled water for 2 h, then dried using filter paper and kept in a desiccator over silica gel. The PA 6 films were immersed in a mixture of indium sulfate ($\text{In}_2(\text{SO}_4)_3 \cdot 7\text{H}_2\text{O}$) and thioacetamide ($\text{C}_2\text{H}_5\text{NS}$) solutions at 70 °C. The samples were kept in the solution for 10 to 70 min.

The structural and morphological characteristics of the resulting layers were investigated using X-ray diffraction analysis. Two research methods were employed: conventional X-ray diffraction (XRD) and grazing incidence X-ray diffraction (GiXRD). The results were analyzed and compared. Both analyses confirmed the successful formation of crystalline In_2S_3 thin films on the surface of polyamide 6.

This study presents an environmentally friendly and cost-effective approach for depositing In_2S_3 layers on polyamide 6 surfaces. X-ray diffraction analysis confirms the successful formation and structural quality of the deposited films. The results support the development of sustainable and low-impact materials for future optoelectronic and energy-related applications, offering an eco-friendly alternative to conventional, resource-intensive technologies.

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- [1] P. Murahari, D. Alagarasan, S. S. Hegde, H. D. Shetty, M. Verma, N. A. Siddiqui, A. Khan, and S. P. Kollur, "High-performance photodetector applications of antimony doped indium sulfide thin films: Preparation, characterization and optical studies," *Optical Materials*, vol. 162, Art. no. 116903, 2025, doi: 10.1016/j.optmat.2025.116903
- [2] A. Ledesma-Juárez, J. F. Quintero-Guerrero, and A. M. Fernández, "Structural, morphological and optical comparison of In-S films deposited by CBD and ultrasonic pyrolytic spraying, as a buffer layer in CIGS solar cells," *Chalcogenide Letters*, vol. 22, no. 12, pp. 1009-1018, 2025, doi: 10.15251/CL.2025.2212.1009.