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Investigation of ZnS-Mg thin films prepared by sol-gel method

M Gholampour, M Simiari, and S Kazempour Ishka

Department of Physics, Faculty of Basic Science, Imam Ali University, Tehran, Iran

E-mail: sobhan.kazempour1989@gmail.com

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Abstract

In this paper, different aspects of making ZnS and ZnS-Mg thin films coated on germanium (Ge) substrate are studied by the sol-gel method. The main goal is to preserve the optical window property of ZnS-Mg thin films that can be used in infrared thermal imaging systems. First, the method of synthesizing transparent and stable sols of ZnS and ZnS-Mg is studied. In this regard, the best molar ratio of materials, the best temperature, and the best conditions for the preparation of ZnS and ZnS-Mg sols are presented. Subsequently, the essential aspects of the spin coating of thin films on the germanium (Ge) substrate are evaluated. These components include; the best rotation speed, best drying temperature, and the best annealing temperature under Argon gas. Furthermore, according to Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and UV-VIS transmission spectroscopy, we characterized the chemical bond, crystal structure, and the optical window property of infrared spectrum transmission for the ZnS-Mg thin films which deposited on Germanium substrate. Finally, the preservation and existence of the optical window property of the infrared transmission spectrum in ZnS-Mg thin films are shown.

Keywords: nanostructure, thin film, zinc sulfide, magnesium, sol-gel, infrared

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