ABSTRACTS

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- Materials Science and Applications*

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INTERNATIONAL CONFERENCE ON SOLID STATE CRYSTALS - MATERIALS SCIENCE AND APPLICATIONS

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CONTENTS

C36 Growth of PbS on silicon substrate deposited by silar techniques

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PbS has a cubic crystal structure, a narrow direct band gap, small effective mass and high electron mobility and is suitable for the near - infrared - sensors (1-3 μm), active layers in heterostructures lasers, OR for photothermal conversion applications, that can be fine tuned by temperature and current. PbS thin films are usually deposited from gas phase, atomic layer epitaxy chemical and electrochemical methods. One of the perspective trends is application of PbS films on the silicon wafers. Photosensor structures can be integrated with silicon microelectronic devices using silicon fabrication procedures.

Lead sulfide thin films were grown on (100) and (111) Si substrates by successive ionic layer adsorption and reaction (SILAR) technique from the aqueous precursor solutions. The PbS thin films composition was measured by X - ray photoelectron spectrometer. Surface analysis was made by Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM). In this work we have used the cantilever technique (laser interferometer) to measure the stress in lead sulfide thin films.

Thickness of the policrystaline PbS thin films deposited on Si (100) substrate change from 22 to 118 nm, and on Si (111) – from 23 to 100nm. Roughness and stoicheometry of thin films were investigated as a function of thickness of thin films. Periodic variations of stoicheometry with the thickness of thin film was found. Critical thickness (90 nm) where optical properties of thin film correspond to the bulk and was defined.

C37 Effect of substrate temperatature on the optical properties of chromium films

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Substrate temperature is one of the important deposition parameters, which dictates many physical properties of thin films to a large extent. This paper deals with the effect of substrate temperature on the optical properties of chromium films in the thickness range 5 - 70 nm. The method of preparation of chromium films are given elsewhere (1). Soon after the growth, the films were taken out of the vacuum chamber and used in the trasmittance measurements using DK2 Ratio Recording Sphetrophotometer in the visible region of incident radiation for both the films grown at substrate temperatures 27 C and 180 C. From the transmittance data of the films, we have evaluated the optical constants, the refractive index (m) and the extinction coefficient (k) for both the films. It has been found that the transmittance, the refractive index and the extinction coefficient are strongly depend upon the substrate temperature. Using Lambert's law the absorption coefficients (a)are calculated for both kinds of films and later the energy band gap.

(1) L.A. Udachan & M. A. Angadi, Journal of Materials Science Letters 16 (1981) 1412

C38 The impact of the LWIR photodiodes geometry on their basic parameters

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This paper concerns HgCdTe heterostructure photodiodes for detection of infrared radiation from 8 – 12 μm spectral range. Heterostructures were made by liquid phase epitaxy on the CdZnTe substrates. The cap layer of wider energy gap was used to suppress the generation – recombination current from the top contact. P-on-n junctions were placed in the narrow band-gap area close to the graded region. It was accomplished by appropriate As diffusion. Photodiodes were mesa delineated and illuminated through the substrate. We carried out the analysis of the impact of contact locations and mesa depth on photodiode parameters. We also made a series of elements of different junction radius to determine the volume parameters: R_0A_{vol} and η_{vol} (for element with infinite junction area). The impact of the carrier lateral collection on quantum efficiency was described briefly. All the experimental results were compared with two-dimensional numerical calculations performed in APSYS.