force (AFM) and scanning electron (SEM) microscopies respectively, but the X-ray diffraction (XRD) was applied for structural investigations of the grown films.

To characterize the gas sensing properties of the films two or more gold electrodes were deposited onto the film surface, keeping the distance of ~ 5 mm. For tellurium films grown on Si/SiO_2 substrates, the previously deposited Pt electrodes (distance ~ 0,5 mm) have served as electrical contacts. It is shown that the films grown on both Pyrex and oxidized silicon are continuous and smooth, but those grown on sintered alumina consists of interconnected islands. On the other hand, the microstructure of Te films is mostly influenced by the growing rate. Dependent on the nature of substrate, the he increasing of the film deposition rate from 10 nm/s to 30 nm/s and more, results in transformation of nanocrystalline structure of the film into an amorphous or predominant amorphous one. Although, independently on the film's microstructure, it exhibits sensitivity to low concentration of nitrogen dioxide [1,2], here we have established that transition from a ninocrystalline structure to an amorphous one affects both the resistivity and gas - sensing parameters. The resistivity increases by 1-2 orders of magnitude while the sensitivity and the response time decrease approximately by 10 % and 25 % respectively. The sensitivity and response/recovery times depends also on geometry of the specimen, especially on thickness of the film. The obtained results have shown that either nanocrystalline or amorphous tellurium films are suitable for development of NO_2 gas sensors operating at room temperature, taking only into consideration [3] that the ultrathin films can be applied only for the fast detection of very low (< 1ppm) concentrations of this gas.

Acknowledgement

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Theoretical Approach to Study the Solid State and Optical Characteristics of calcium Sulpide [CaS] Thin Film.

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Calsium sulphide thin film has been studied in this work using theoretical approach in which a scalar wave is propagated through the material thin film deposited on a glass substrate with the assumption that the dielectric medium has homogenous reference dielectric constant term, ε_{ref} and a perturbed dielectric function, $\Delta\varepsilon_{p}(z)$ representing the deposited thin film medium on surface of the glass substrate is presented in this work. These two terms, constituted arbitrary complex dielectric terms that describes dielectric perturbation imposed by the medium of for the system. This is substituted into a defined scalar wave equation in which the appropriate

Green's Function in conjunction Dyson's equation was defined on it to reduce it to Volterra equation of second type with the kernel $k(z, z') = G(z, z')V(z')$ is solved using series solution technique in conjunction with Born approximation method in order to obtain a model equation of wave propagating through the thin film.

This was used in computing the propagated field, $\psi(z)$ for different input regions of field wavelength such as ultraviolet, visible and infrared region respectively during which the influence of the dielectric constants of the thin film on the propagating field were considered. The results obtained from the computed field were used in turn to compute the band gaps, solid state and optical properties of the thin film such as reflectance, Transmittance and absorbance.

Nano-structure formation in ternary chalcogenide thin films

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Thin films of As-S-Se-Sn and As-Se-Ge chalcogenide semiconductors of different composition have been used for direct e-beam recording of diffraction grating structures by SEM, EBL, and holography techniques. As a result it was established that in these gratings besides modulation of the amplitude phase characteristics the formation of a nano-relief takes place, which correspond to the amplitude and relief-phase changes (Fig.1). The recorded grating structures in studied thin films also were examined using the AFM (Fig.2). The dependence of the diffraction efficiency of gratings with the period of Δ=1 μm and Δ=2 μm versus the radiation dose and composition was investigated.

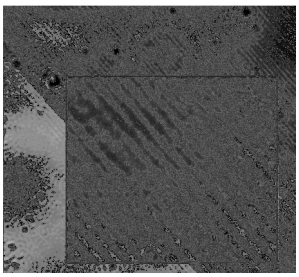

Fig.1 AFM image of the surface relief grating structure

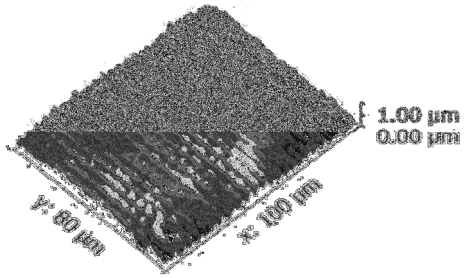

Fig.2 Modulation of the film thickness by EBL

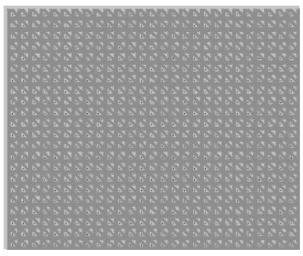

Fig.3 The design of superimposed complex structures

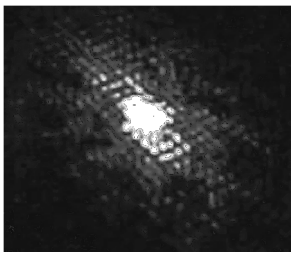

Fig.4 Superimposed complex micro-relief structures