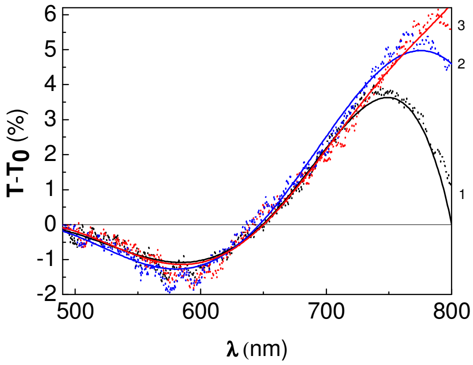

Fig. 1. Increment modification of the transmission spectra of Cu-As_2Se_3 structure (L_{ChG} = 0.27 µm) for different values of the electrical field of corona discharge U: - 7 kV (1), 0 kV (2) and + 7 kV (3).

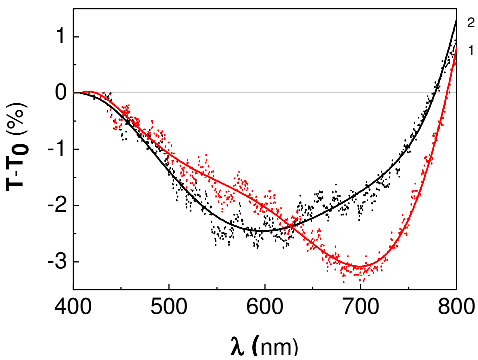

Fig. 2. Increment modification of the transmission spectra of Cu-As_2Se_3 structure (L_{ChG} = 0.11 µm). Curve 1 - exposure in the field of corona discharge (U: - 7 kV) and curve 2 - exposure without corona discharge.

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Nanocrystalline and amorphous tellurium films for gas sensing applications

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Microstructural peculiarities and gas (NO_2) sensing properties of tellurium thin films dependent on the technological procedures of their physical grow are presented. The fabrication of the films was provided using thermal vacuum evaporation method but the investigation were focused to establish the interdependence between the technological conditions of their growth process and both structure / morphology and gas sensing properties. Tellurium (purity 99.999 %) based thin films have been prepared using different grow rates (10 - 40 nm/s) onto Pyrex glass, sintered alumina (Al_2O_3) or Si/SiO_2 substrates. Samples of different thicknesses were prepared by variation of the evaporation time, while the distance between the evaporation boats (~20 cm), working pressure (~ 10^{-4} Pa) and substrate temperature (~25 ^0C) have been kept constant. The thicknesses and the surface morphology of the films were investigated by atomic 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