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Influence of corona discharge on photoinduced modification of optical characteristic of Cu–As_2Se_3 thin film srructures.

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It was established [1], that application of negative corona discharge during recording of optical holographic diffraction gratings in Cu-As_2Se_3 thin film structures, in comparison of positive corona discharge, increase the holographic sensibility, the diffraction efficiency and the depth of the chemical etched relief. But in this work was not investigated the photoinduced modification of the transmission spectra of the Cu-As_2Se_3 structure during the light irradiation without and in the field of corona discharge. In the present paper the investigation nof the corona discharge, applied during light exposure on the photoinduced modification of the transmition spectra of the as-deposited Cu-As_2Se_3 thin film structure. Thin films of Cu and As_2Se_3 were sequentially deposited by the vacuum thermal evaporation ($p = 4x10^{-3}$ Pa) from the Mo boats onto unheated glass substrates. The Cu-As_2Se_3 thin film structures were exposed for different polarities and values of the electrical field of corona discharge and without corona discharge. In the region of weak absorption coefficients in the transmission spectra of the investigated structures was observed photobleshing, while in the region of fundamental absorption the thin film structures exhibit photodasrkening (Fig. 1 and Fig. 2). All spectral dependences of the photoinduced changes of the transmission coefficient represent a curve with minimum. In the region o weak absorption higher values of photobleshing was observed during exposure of the investigated thin film strucure in the field of positive corona discharge. When is applied the negative corona discharge the weakness photobleshing was observed. The ratio of achieved values of the maxima in the expositional dependences of the diffraction efficiency of the holographic gratings using simultaneously during recording the corona discharge of different polarity [1] are in accordance with the respective photoinduced changes of the transmission The obtained results qualitatively are analyzed taking into account the photodarkening of the semiconductor during it doping with Cu and increasing of the transmission of the structure during photodiffusion of the cupper in the amorphous semiconductor.

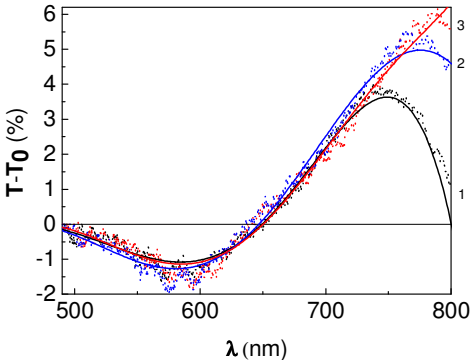

Fig. 1. Increment modification of the transmission spectra of Cu-As_2Se_3 structure (L_{ChG} = 0.27 μm) for different values of the electrical field of corona discharge U: - 7 kV (1), 0 kV (2) and + 7 kV (3).

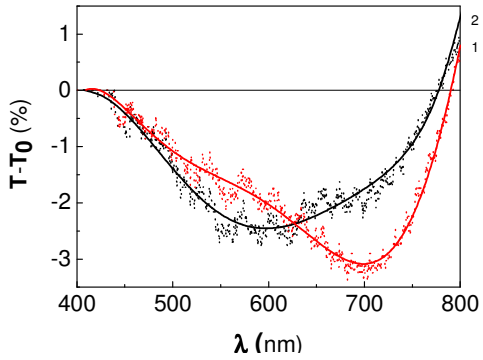

Fig. 2. Increment modification of the transmission spectra of Cu-As_2Se_3 structure (L_{ChG} = 0.11 μm). Curve 1 - exposure in the field of corona discharge (U: - 7 kV) and curve 2 - exposure without corona discharge.

References

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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