

Electron-Beam Recording of Surface Relief's Using $\text{Ge}_5\text{As}_{37}\text{S}_{58}\text{-Se}$ Nanomultilayers as Registering Media

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Thin films based on chalcogenide glasses have rapidly evolved as light sensitive materials for high density recording media application due to their optical and structural properties. In this work the experimental results showing the surface relief formation in $\text{Ge}_5\text{As}_{37}\text{S}_{58}\text{-Se}$ nanomultilayer structures under e-beam exposure are presented.

Amorphous $\text{Ge}_5\text{As}_{37}\text{S}_{58}\text{-Se}$ nanomultilayers were prepared by computer driven cyclic thermal vacuum deposition from two isolated boats with $\text{Ge}_5\text{As}_{37}\text{S}_{58}$ and Se on constantly rotated glass substrate with deposited ITO layer at room temperature in one vacuum deposition cycle. The technology allows depositing thin films with thicknesses from 0.005 up to 3.0 μm . The control of the thickness was carried out in-situ during the thermal evaporation by interference thickness sensor at $\lambda = 0.95 \mu\text{m}$. Overlapping part of samples contains alternating nanolayers of $\text{Ge}_5\text{As}_{37}\text{S}_{58}$ with thickness of 1020 nm and Se with thickness of 1980 nm. The total number of nanolayers was 200. Control layers of $\text{Ge}_5\text{As}_{37}\text{S}_{58}$ and Se compositions were deposited at the same time onto the same substrate consequently through masks and used to check the composition and calculate the ratio of the sub-layer thicknesses in one modulation period. Diffraction gratings with 1, 2 and 4 μm period (and different exposure) were recorded by e-beam exposure using scanning-electron microscope Tesla BS 300 with programmable exposure control unit. The accelerating voltage was 25 kV and the size of the electron spot at this voltage was about 300 nm. Morphology and surface relief of the obtained gratings were

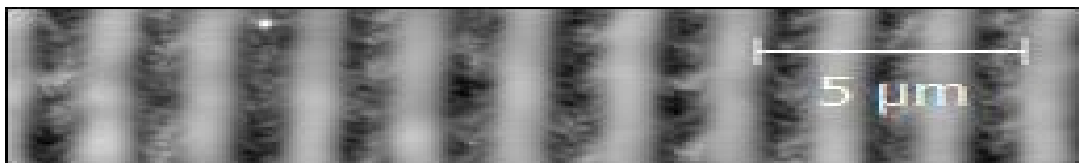


Fig.1 Surface of diffraction grating recorded in $\text{Ge}_5\text{As}_{37}\text{S}_{58}\text{-Se}$ multilayers

studied by AFM microscopy. In Fig.1 AFM image of surface relief grating with 2 μm period recorded by e-beam exposure is shown. Diffraction efficiencies of the recorded gratings consisted $\sim 1\text{-}2\%$ on He-Ne laser wavelength (632.8 nm). The obtained results show possibility of $\text{Ge}_5\text{As}_{37}\text{S}_{58}\text{-Se}$ nanomultilayer structures use as an electron beam assisted recording media.

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