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However, the uses of standard fitting models which are presented into ellipsometre data base give not sufficient accuracy. Individual fitting model based on the well-established exponential absorption inside the band gap tail and Tauc fundamental absorption was developed.

Dynamic Taylor cone formation on chalcogenide films surface

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We investigated the formation of surface reliefs during the interaction of an electron beam (EB) with $Ge_9As_9Se_{82}$ films. The films (thicknesses 2μm) were irradiated by an EB using a scanning electron microscope (Tescan, model VEGA) in dose range $G=9.3\times10^3$–9.3×10^7 μC/cm^2. A square lattice of dots was exposed on the surface of films. Surface relief of the film was studied by atomic force microscope (Bruker, model ICON). It has been detected that three distinct types of surface features are formed in that dose range. In dose interval 9.3×10^3–2.8×10^5 μC/cm^2 the EB induces the formation of cones with a Gaussian profile. The cone height is 250–270 nm. In dose interval 5.6×10^5–1.9×10^6 μC/cm^2 the cone surface protrudes upward along the surface normal and becomessharper, eventually evolving into a Taylor cone. With increasing exposure dose its height increases from 380 nm to 560 nm. In dose interval 4.6×10^6–9.3×10^7 μC/cm^{2}a combined shape relief is formed. We observe the formation of a crater with depth 530 nm and a giant Taylor cone (750-2510 nm) on the edge of each crater. The formation of the surface relief is caused by structural changes in the film and the emergence of the space charge region (SCR) during the interaction between $Ge_9As_9Se_{82}$film and EB. We find that several distinct types of surface features can be formed, depending on density and size of deposited charge into SCR. Taylor cones formed during electrohydrodynamic material flow, which occurs in SCR when certain instability limits are met. We find that development of electrohydrodynamic instability on the film surface occurs when the pressure forces of the electric field into space charge region exceed the pressure of surface tension forces. We believe that observed phenomena are interesting not only from fundamental but also applications perspective.

Influence of size factors on the formation of surface relief in amorphous chalcogenide films during periodic charge deposition by electronic beam

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Changes in shape and parameters of electron beam (EB) induced surface relief of chalcogenide films have been investigated depending on the film thickness and distance between the irradiated areas. For measurements we used $Ge_9As_9Se_{82}$ film with thicknesses 3.0μm, 3.5μm, 4.5μm on sapphire substrates. We found that the film thickness, the distance between irradiated areas and charge removal rate affects characteristics of surface relief formation in the high dose regime. Significant change in surface relief is observed in the dose interval $4.6*10^6$–$9.3*10^7$ μC/cm^2 when distance between irradiated areas less than 6μm decreases. At dose $9.3*10^7$ μC/cm^2 this relief consists from craters with two different depths (250nm, 800nm) and giant (2.5μm) spires formed at the edge of the big crater. Shallow and large craters appear in alternating manner in chessboard-like arrangement. Our result is explained by the formation of charge distribution bilayer under electron irradiation of chalcogenide films and subsequent flow of the self-consistent currents generated in irradiated area. The size of the interaction region of the EB with $Ge_9As_9Se_{82}$ film has been determined (6.2μm). The appearance of surface relief is associated with formation into film the space charge region (SCR) induced by EB. We find that when matrix period is of comparable with size SCR the chessboard-like lattice is formed in films with thickness larger than 3μm by the overlap of neighboring space charge regions in irradiated areas. When matrix period is larger than SCR surface reliefs generated in single step charge deposition step are identical. When film thicknesses is 4.5μm and matrix period is 10μm parameters of electron-induced relief reach gigantic values: cone height - 3880nm, depth of crater - 1310nm. We demonstrate that by variation of lattice period during periodic charge deposition in chalcogenide thin films we could directly experimentally define SCR size in these materials.

Relaxation processes in chalcogenide glasses

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Relaxation processes in chalcogenide glasses of the Se, As-Se, Ge-As-Se systems have been investigated by dynamic mechanical analysis technique. Temperature dependence of internal friction and real and imaginary parts of the shear modulus of chalcogenide glasses were measured in the mode of forced torsional and bending vibrations. In selenium-rich glasses of As-Se and Ge-As-Se systems was found maxima of internal friction and of shear modulus imaginary part in the temperature range 200K-250K. This relaxation process can be identified as β-process of mechanical relaxation. Its activation energy lie in the range of 0.5-1 eV. Parameter relaxation time distribution was determined from the cole-cole diagram (0.15-0.2). We shown that the cause of β-process of these glasses can be relaxation of their structure in region of local disordering in the vicinity of selenium atoms with dangling bonds, as well as the fluctuation microcavities. The relaxation maximum of internal friction is observed in the glass transition temperature for all glasses under investigation. This relaxation process was classified as α-process of mechanical relaxation these glasses. This process is caused by complete defreezing of the mobility of glass structural elements. Highelasticity plateau is observed on the temperature dependence of the shear modulus in Se-rich glasses of Ge-As-Se system as well as in Se and in glasses As-Se systems. Parameter relaxation time distribution was determined from the Cole-Cole diagrams. It was found that the full relaxation spectrum of chalcogenide glasses formed three relaxation processes: α-relaxation is determined by full unfreezing of mobility of the structure units and the transition of glasses into the heighelastic state; β-relaxation which can be associated with the relaxation of glass structure in regions of local disordering in the vicinity of atoms with unsaturated (dangling) bonds; γ-relaxation of selenium is determined by the twolevel systems in the atomic twohole potential.

Ultrasound modulation of the structure of glassy chalcogenides

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Our previous experiments on ultrasonic treatment of the softening Se-X glasses (X= Te, S, As, Cl) [1-4] are reconsidered here using a special representation of the optical transmission data for the Se-Te series as an example. The obtained results lead to the conclusion that glass behaves as the *self-organizing* system of the dissipative type. A characteristic dissipative pattern is considered as the *bond wave* [5], whose wavefronts