

Chalcogenide glasses: properties and applications

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In present report the recent results on studies of structural properties of chalcogenides glasses (CG), and their application in holographic recording are reviewed. The changes of optical, thermal and other properties of chalcogenide glasses and functional materials structures on their base are connected with changing of the structure. XRD, EXAFS, AFM, SEM techniques and Raman spectroscopy were used as tools in studying the structural peculiarities of CG's. As₂S₃-As₂Se₃, As₂S₃-Sb₂S₃, Ge-As-(S)Se, and Ge-S-Ag, Ag-As-S chalcogenide glasses. Pair distribution functions were obtained using XRD data. Evolution of first coordination sphere position with glass composition was analyzed. Bonds length's and patrial coordination numbers were estimated. Raman data show presence of different nanohases whose concentration changes along the chosen compositional cross-section. Surface relief holographic diffraction gratings were directly recorded using composite nano-multilayered structures using some studied chalcogenide glasses. Diffraction efficiency values of the recorded gratings in transmission were ~22%. AFM measurements have shown high quality of the recorded gratings relief's. Direct surface patterning of 2D structures using As-S-Se layers by e-beam was performed. Digital holograms were directly recorded composite nano-multilayered structures. Reviewed investigation results concerning chalcogenide glasses show that chalcogenide glasses are perspective for various applications in photonics.

Topics

Session A. Physics of condensed matter and spectroscopy

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