Nanocomposites and nanomaterials

Effect of CsCl on the optical spectra of the GeS_2-Ga_2S_3 glasses

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Chalcogenide glasses (ChG) based on Ge-Ga-S have shown many advantages for potential applications of optical modulator, efficient laser host materials, fiber-optical amplifier in the IR region [1]. Addition of CsCl to ChG matrix result in improvement of their mechanical properties and changes optical properties.

In this work the optical properties in visible and far-infrared (FIR) regions of ChG belonging to the series $(80GeS_2–20Ga_2S_3)_{100–x}(CsCl)_x$ with x = 0; 5; 10; 15 were investigated. It is shown that the addition of CsCl induces a white shift of the visible transmission. By adding up to 15% mol. of the alkali halide in the glassy matrix, the band-gap evolves from 2.64 eV to 2.91 eV. From a structural point of view, the addition of less than 15 % of CsCl in GeS2–Ga2S3 glasses is characterized by the formation of $GaS_{4-x}Cl_x$ tetrahedral that are dispersed in the glass network. In other words, the average number of Ga–S bonds is decreased for the benefit of the average number of Ga–Cl bonds.

In addition, the influence of temperature on FIR spectrum of $80GeS_2–20Ga_2S_3$-CsCl glasses has been investigated by Fourier Transform Infrared (FTIR) spectroscopy measurements at 77 K, 120 K, 150 K and room temperature.

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1. *Hubert M., Delaizir G., et all.* An innovative approach to develop highly performant chalcogenide glasses and glass-ceramics transparent in the infrared range // Optics Express. – 2011. – **19(23)**. – P. 23513-23522.