Influence of the Stoichiometry on Raman Spectra of the Amorphous Phase Change Alloys for Future Memory and Display Applications

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Phase change (PC) materials are promising materials for data storage, display and data visualization applications due to the remarkable difference of their electrical and optical properties in the amorphous and crystalline state. Amorphous phase of phase change materials is bonded covalently, while crystalline phase crystalline has resonant bonding. [1].

PC materials have already been employed in optical data storages (CD's, DVD's, Blu-Ray disks). Memories based on PC materials are a candidate to replace flash memory for non-volatile data storage applications [2]. By combining the optical and electronic properties of phase change materials, display and data visualization applications can be created [3].

A fundamental understanding of the properties and stability of the amorphous state of phase change alloys has important implification in optimizing materials for next generation of storage media and smart displays.

Three amorphous Ge-Sb-Te alloys along the co-called pseudo-binary line have been investigated using Raman spectroscopy in this study. In amorphous Ge-Sb-Te alloys the Ge and Te atoms occupy the octahedral and tetrahedral symmetry positions [4]. Several phonon peaks have been observed in Raman spectra of studied $Ge_1Sb_2Te_4$, $Ge_2Sb_2Te_5$, and $Ge_3Sb_2Te_6$ samples at around 70, 127, 155 and 210 cm^{-1}. Correlation between stoichiometry, intensity and width of these peaks has been analyzed and discussed.

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