REALIZATION OF ORDERED PHASE CHANGE MATERIALS AND THEIR INVESTIGATION VIA ELECTRICAL TRANSPORT, TERAHERTZ AND RAMAN SPECTROSCOPY

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Phase Change Materials (PCMs) are unique compounds employed in non-volatile random access memory thanks to the rapid and reversible transformation between the amorphous and crystalline state that display large differences in electrical and optical properties. In addition to the amorphous-to-crystalline transition, experimental results on polycrystalline alloys evidenced a Metal-Insulator Transition (MIT) attributed to disorder in the crystalline phase.
Here we make use of fundamental advance in the fabrication by molecular beam epitaxy of ordered alloys and heterostructures. We assess the degree of ordering by X-ray diffraction and explicitly correlate it with the MIT by means of electrical transport [1]. We further tune the ordering in a controlled fashion attaining a large range of resistivity. A combination of Terahertz and Raman spectroscopy is employed to investigate vibrational modes and the carrier behavior in amorphous and crystalline ordered epitaxial alloys [2].
Finally, superlattices made of alternating layers are studied by micro-Raman spectroscopy. A structural irreversible transformation into ordered alloys is induced by high power laser light exposure. The absence of this configuration after *in situ* annealing even up to 300°C evidences an electronic excitation induced-transition which brings the system into a different and stable crystalline state [3].

Keywords: PCM; MBE; Raman

References

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