PHOTOEMISSION STUDY OF AMORPHOUS AND CRYSTALLINE GeTe AND (Ge,Mn)Te SEMICONDUCTORS

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IV-V (Ge,Mn)Te dilluted magnetic semiconductor is one of promising material in spintronics which exhibits carrier-induced ferromagnetism (described by RKKY mechanism) and ferroelectric properties depending on carrier and magnetic Mn ions content. Also, this material obtained in amorphous form offers possibility to ultra fast switching from amorphous to polycrystalline phase by applying laser beam or electric current. (PCM material). The scope of our project is to investigate and compare electron density of states of GeTe and (Ge,Mn)Te in amorphous and monocrystalline form using Tunable VUV and photoelectron spectrometer.

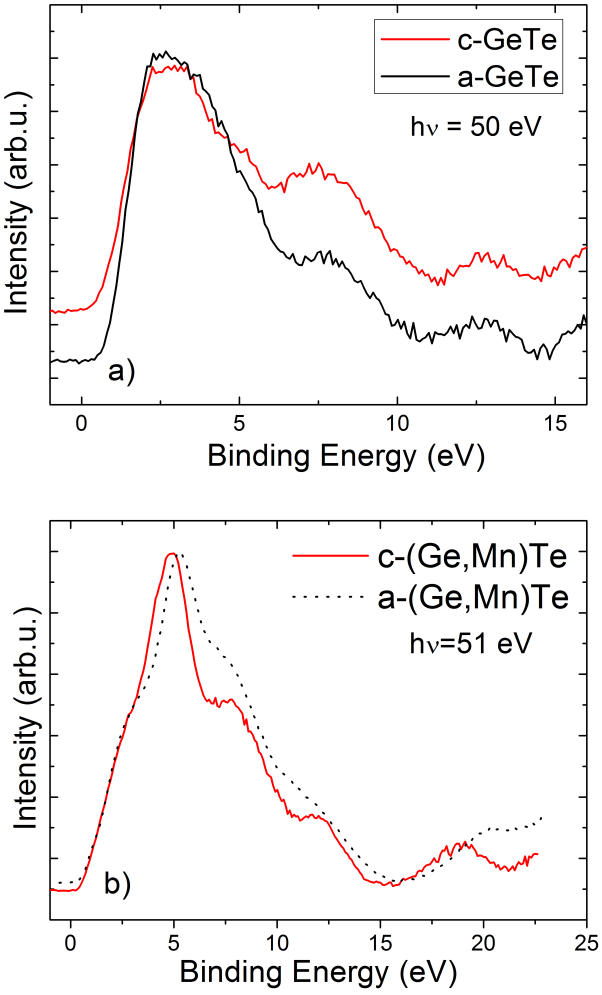

Figure 1: The valence band photoemission spectra of amorphous and crystalline GeTe (a) and (Ge,Mn)Te (b). The spectrum of (Ge,Mn)Te was measured at the energy corresponding to the Mn 3*p*-3*d* threshold.

These materials were grown on insulating BaF_2 by molecular beam epitaxy technique (MBE) employing effusion cells with GeTe, Te_2 and Mn content. To achieve monocrystalline GeTe and (Ge,Mn)Te semiconductors substrate temperature was kept at $T = 250°C$. For GeTe and (Ge,Mn)Te in amorphous form at room temperature.

XRD measurements performed at room temperature revealed monocrystalline (111)-oriented rhomboedral structure of GeTe and GeMnTe semiconductors. No evidence of crystalline phase was experimentally observed in amorphous semiconductors. In our investigation we compare photoemission spectra obtained at photon energy range $h\nu = 45$ – 60 eV which corresponds to experimentally observed three-peak structure valence band states in GeTe (Fig. 1a), and Fano resonance corresponding to Mn 3*p*-3*d* transition in GeMnTe (Fig. 1b) at the same range of photon energy. The contribution of Mn3*d* electrons was determined as located in valence band with binding energy 3.8 eV below Fermi level.

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