Study by ARPES of the Rashba effect and Berry curvature in the 2D Ferroelectric thin films of GeTe

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Ferroelectric Rashba Semiconductors (FERSCs) belong to a new family of semiconductors which is very exciting for fundamental aspects and their possible applications in spintronics for example. Thanks to the two combined properties, Rashba effect and Ferroelectricity, this type of material would make possible to switch the spin polarization by reversing the ferroelectric polarization [**1**]. Recently GeTe has been proposed as the father of this family. It has a bulk band structure with giant Rashba-like splitting due to the inversion symmetry breaking associated with a ferroelectric polarization.

In this communication, we present a detailed analysis from high resolution Angle Resolved Photoemission Electron Spectroscopy (ARPES) of the band structure of GeTe as thin (400 nm-600 nm) and ultrathin (1-5 nm) films epitaxially grown on Si(111) and graphene/SiC. We show that the band structure of thin films is very different from thick ones (see figure 1). The evolution with thickness of the Rashba coefficient has been investigated and the experimental value for thick layers is found very close to what was predicted by DFT calculations [**2].** Finally, we will present circular dichroism ARPES measurements which allow to investigate the berry curvature in non centro symmetric solids like GeTe [3].

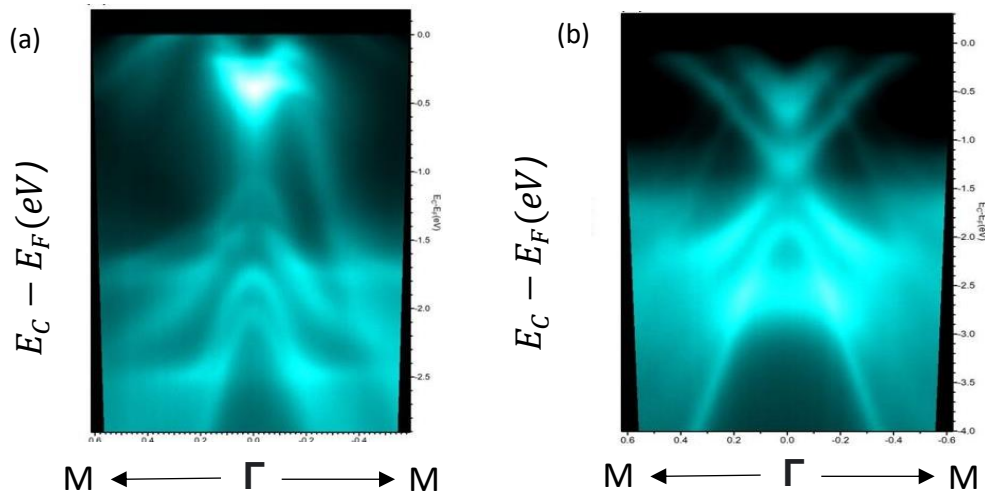

Figure 1 : ARPES intensity maps on α-GeTe recorded with linear polarization at 25eV for different thicknesses: (a):400nm and (b): 2nm

[1] C. Rinaldi et al, Ferroelectric control of the spin texture in GeTe. Nano Letters, (18):2751 - 2758, January 2018.

[2] X. Yang et al, Three-dimensional limit of bulk Rashba in ferroelectric semiconductor GeTe. nano letters, (21):77,83, January 2021.

[3] Soohyun Cho et al, Experimental observation of hidden Berry curvature in inversion-symmetric bulk 2H-WSe2. Physical Review Letters, 121(18):186401, October 2018.