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## 磁性半導体(Ga,Mn)As における強磁性不純物バンドの解明

## Unveiling the Impurity Band Inducing Ferromagnetism in Magnetic Semiconductor (Ga,Mn)As

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Diluted magnetic semiconductor (DMS) is defined as a host semiconductor doped with several percent of magnetic impurity. In ferromagnetic DMS, it is considered that the ferromagnetic interaction between the magnetic ions is mediated by itinerant carriers of host semiconductor, so-called “carrier-induced ferromagnetism”. III-V-based DMS  $\text{Ga}_{1-x}\text{Mn}_x\text{As}$  is a typical ferromagnetic DMS demonstrating hole-concentration dependence of the magnetic properties [1] and has been studied intensively from fundamental points of view so far [2]. The knowledge of the valence-band (VB) electronic structure is essential to understand the origin of ferromagnetism in  $\text{Ga}_{1-x}\text{Mn}_x\text{As}$  [3].

In this study, we have conducted soft X-ray angle-resolved photoemission spectroscopy (SX-ARPES) measurements on  $\text{Ga}_{1-x}\text{Mn}_x\text{As}$  thin films to obtain a fundamental understanding of the valence-band electronic structure. The band dispersion around the  $\Gamma$  point, i.e., the top of VB maximum of GaAs, does not intersect the Fermi level. The resonant ARPES at the Mn  $L_3$  edge have revealed that the non-dispersive Mn impurity band responsible for the ferromagnetism is located near the VB maximum. These results will give an obvious picture of the VB electronic structure of  $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ . Based on the findings, we will discuss the origin of carrier-induced ferromagnetism in (Ga,Mn)As.

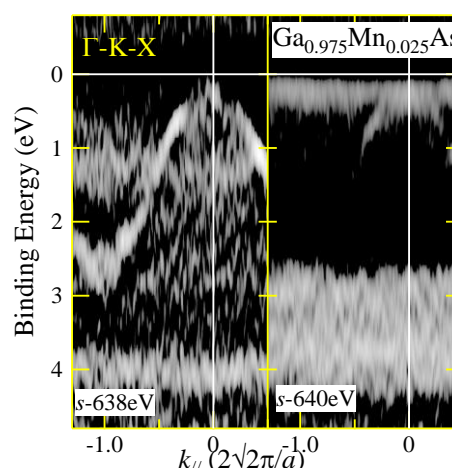


FIG.1 Mn- $L_3$  resonant ARPES images on  $\text{Ga}_{0.975}\text{Mn}_{0.025}\text{As}$ . Left: off-resonance, Right: on-resonance.

References:

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