Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Different symmetry of the magnetization-direction dependence between the impurity band and valence band in GaMnAs[1] IRIYA MUNETA, TOSHIKI KANAKI, SHINOBU OHYA, MASAAKI TANAKA, The University of Tokyo — In semiconductors with heavily doped with nonmagnetic shallow acceptors, an impurity band (IB) is formed around the valence band (VB) top and merged with VB. As a result, the parabolic VB top is strongly deformed in a non-parabolic dispersion. In GaMnAs, however, the VB top keeps the parabolic dispersion though there is energy overlap between VB and IB [1–3], which is completely different from the conventional nonmagnetic semiconductors. Here, we measure tunneling anisotropic magnetoresistance on GaMnAs tunnel devices in a spectroscopic way [4–6], analyze the magnetization-direction and energy dependence of the density of states (DOS), and investigate the different symmetry between VB and IB to clarify the mysterious overlap between the two bands. We find that the magnetization-direction dependence of VB DOS is mainly four-fold symmetry along [100] which is the same as the crystal symmetry, while that of IB DOS is mainly two-fold symmetry along [110] unlike the crystal symmetry. These results reveal the unique band structures of Mn-doped III-V ferromagnetic semiconductors. [1] S. Ohya et al., Nat. Phys. (2011). [2] I. Muneta et al., APL (2013). [3] M. Kobayahsi et al., PRB (2014). [4] C. Gould et al., PRL (2004). [5] H. Saito et al., PRL (2005). [6] L. Gao et al., PRL (2007).

[1]This work was partly supported by Grant-in-Aids for Scientific Research including Specially Promoted Research, I.M. thanks the JSPS research Fellowship Program for Young Scientists.

Iriya Muneta
The University of Tokyo

Date submitted: 13 Nov 2014 Electronic form version 1.4