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Valence band ordering restored by the p-d exchange interaction in GaMnAs¹ IRIYA MUNETA, HIROSHI TERADA, SHINOBU OHYA, MASAOKI TANAKA, The University of Tokyo, Japan — In ferromagnetic GaMnAs, it is predicted that the Mn impurity level or impurity band (IB) is formed in the band gap by the strong *p-d* exchange interaction with the hybridization [1], which is consistent with the recent result of x-ray photoemission unveiling the disordered IB [2]. Although the hybridization might be expected to result in the disordered or merged valence band (VB), it was found that VB is almost unchanged by Mn doping in GaAs [2-4]. In order to understand the bandstructure and ferromagnetism of GaMnAs induced by the strong exchange interaction, we measured the VB ordering by using the resonant tunneling spectroscopy in the GaMnAs quantum-well (QW) double-barrier heterostructures with the Mn content x varied from 0.4% to 2.3%. In $x < 1\%$ (paramagnetic), the d^2I/dV^2 oscillations weaken as x increases, which shows that VB merges with the *paramagnetic* IB and becomes disordered. However, the oscillations are restored at the onset of the ferromagnetism ($x > 1\%$) and become stronger as x increases. Our results show that the strong exchange interaction does not fluctuate VB but forms the disordered IB. [1] Krstajić et al., PRB (2004). [2] Kobayashi et al., arXiv:1302.0063 (2013). [3] Ohya et al., Nat. Phys. (2011). [4] Muneta et al., APL (2013).

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