

Electric properties of magnetic/nonmagnetic p-n junction diode

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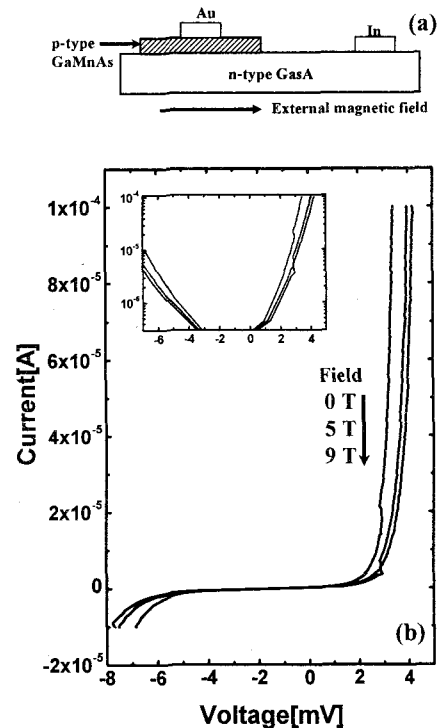
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Recently, it is theoretically predicted that a p-n junction diode made of a magnetic semiconductor adjacent to non-magnetic one may result giant magnetoresistance, spin-voltaic and spin-valve effect due to the spin-polarized current in the presence of an external magnetic field [1]. As a basic step for magnetic bipolar transistor, magnetic/nonmagnetic p-n junction diodes P-type layer (GaMnAs) has been grown by Molecular Beam Epitaxy (MBE) on n-type GaAs substrate. For optimization of the composition of the GaMnAs layer, samples with different content of Mn (4% and 8%) were grown. The devices have been patterned as shown in Fig. 1 (a) by means of optical lithography and wet etching technique. I-V characteristics were measured for various range of temperature (2 ~ 300K) and external magnetic field (0 ~ 9T). Dramatic dependence of the conductance (1400%) on external magnetic field was observed with forward bias. This behaviour is attributed to the giant magnetoresistance effect of the magnetic p-n junction proposed theoretically by Zutic and Fabian [1]. This experimental result verified at least one of the theoretical predictions of the magnetic p-n junction diode.



[1] I. Zutic, et. al, Phys. Rev. Lett. 88, 066603 (2002).