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Spin-dependent tunneling properties in GaMnAs-based magnetic tunnel transistors YOSUKE MIZUNO, Dept. of Electronic Eng., The Univ. of Tokyo, SHINOBU OHYA, Dept. of Electronic Eng., The Univ. of Tokyo; PRESTO JST, PHAM NAM HAI, Dept. of Electronic Eng., The Univ. of Tokyo;, MASAAKI TANAKA, Dept. of Electronic Eng., The Univ. of Tokyo; SORST JST — III-V-based ferromagnetic-semiconductor heterostructures comprising GaMnAs are hopeful candidates for future spintronic devices. Thus far, only two-terminal devices have mainly been studied. Meanwhile, GaMnAs-based 'three-terminal' magnetic tunnel transistors (MTTs) have a potential to add novel functions to integrated circuits. We prepared MTT structures composed of GaMnAs (30 nm)/ AlAs (2 nm)/ GaMnAs (30 nm)/ GaAs:Be (30 nm; $1*10^{17}$cm^{-3}) on p-GaAs(001) substrates using molecular-beam epitaxy (MBE). The V_{EB} dependence of I_C, I_E, and I_B shows that the current transfer ratio α ($= I_C/I_E$) is 0.8-0.95; this is much higher than 0.03, the maximum value reported in metal-based MTTs. The current gain β ($= I_C/I_B$) is of the order of 10, which means that GaMnAs-based MTTs have current amplifiability. The V_{EC} dependence of the tunneling magnetoresistance (TMR) ratio differed significantly from that observed in single-barrier magnetic tunnel junctions (MTJs). This work was partly supported by PRESTO / SORST of JST, Grant-in-Aids for Scientific Research, IT-RR2002 of MEXT, and Kurata-Memorial Hitachi Sci. & Tech. Foundation.

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