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Ballistic spin injection spectroscopy of a (Ga,Mn)As spin Esaki diode MAKOTO KOHDA, Laboratory for Nanoelectronics and Spintronics, RIEC, Tohoku Univ. Japan, TOMOHIRO KITA, Semiconductor Spintronics Project, ERATO, JST, and Laboratory for Nanoelectronics and Spintronics, RIEC, Tohoku Univ., Japan, YUZO OHNO, Laboratory for Nanoelectronics and Spintronics, RIEC, Tohoku Univ., and CREST, JST, Japan, FUMIHIRO MATSUKURA, HIDEO OHNO, Laboratory for Nanoelectronics and Spintronics, RIEC, Tohoku Univ. and Semiconductor Spintronics Project, ERATO, JST, Japan — A p-type ferromagnetic semiconductor (Ga,Mn)As is one of the promising materials for spin injector by interband tunneling [1]. In this work, we investigated injection of spin-polarized electrons in a (Ga,Mn)As/n^+-GaAs Esaki diode (ED) by using a three-terminal device integrating a (Ga,Mn)As ED and a light emitting diode (LED), which allows us to apply bias voltages to the ED and LED independently. Electroluminescence polarization ($P_{\rm EL}$) from the LED was measured under the Faraday configuration as a function of bias voltages. The maximum $P_{\rm EL}$ of 32.4% was observed when the valence electrons near the Fermi energy of (Ga,Mn)As are ballistically injected into the LED. The experimental results proved high spin polarization of valence electrons ($> 85\%$) for 100 meV below the Fermi energy of (Ga,Mn)As. [1] M. Kohda et al., Jpn. J. Appl. Phys. Part2 **40**, L1274 (2001); E. Johnston-Halperin et al., Phys. Rev. B **64**, 041306(R) (2002); P. Van Dorpe et al., Appl. Phys. Lett. **84**, 3495 (2004).

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