

Abstract Submitted
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Spin-polarized current created by quantum point contacts with spin-orbit interaction MIKIO ETO, Faculty of Science and Technology, Keio University, Japan — We propose a new idea to create spin-polarized currents using quantum point contact (QPC) with spin-orbit interaction.¹ Neither magnetic fields nor magnetic materials are required. By numerical studies using Green function recursion method,² we show that (i) the conductance is quantized in units of $2e^2/h$ even in the presence of spin-orbit (SO) interaction, (ii) the current is spin-polarized in the transverse direction, and (iii) a spin polarization of more than 50% can be realized with SO interaction strength in InGaAs heterostructures. The spin polarization stems from the transition between subbands of different spins during the transport through QPC. The spin-polarization ratio is determined by the adiabaticity of the transition, which is evaluated by the Landau-Zener theory. Since the two-terminal devices with QPC are easy to fabricate on semiconductors, they may be utilized for the spin injection in the spintronics.

¹M. Eto, T. Hayashi, and Y. Kurotani, J. Phys. Soc. Jpn. **74**, 1934 (2005).

²T. Ando, Phys. Rev. B **44**, 8017 (1991).

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