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Dynamical spin injection into a two-dimensional electron gas in an AlGaAs/GaAs structure KENRO OHTOMO, YUICHIRO ANDO, TERUYA SHINJO, Kyoto University, TETSUYA UEMURA, Hokkaido University, MASASHI SHIRAISHI, Kyoto University — A two-dimensional electron system in a GaAs-based heterostructure is the attractive platform for spintronics since it has high mobility and spin-orbit interaction can be modulated by the gate voltage[1]. Thus, it is a possible platform to realize electric gate-controlled spin transistor[2]. However, room-temperature spin transport through GaAs-based heterostructure has yet to be shown. We report first spin transport through the quantum well at GaAs/AlGaAs interface at room temperature. We used spin pumping under ferromagnetic resonance to inject spins from the $Ni_{80}Fe_{20}$ to the GaAs/AlGaAs quantum well. Generated spin current propagated through the 1 μm channel and was detected using spin-charge conversion inverse spin Hall effect in the Pt electrode. In agreement with spin pumping theory, polarity of the spin transport signal was reversed together with magnetization of the $Ni_{80}Fe_{20}$. This first demonstration of spin transport through a quantum well at a semiconductor heterostructure interface at room temperature opens a way to realize Datta-Das spin-based transistor.

[1] J. Nitta, et al., PRL 78, 1335 (1997).
[2] S. Datta and B. Das, Appl. Phys. Lett. 56, 665 (1990).

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