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Enhanced Spin Hall Effect by Single Antidot Potential MIKIO ETO, TOMOHIRO YOKOYAMA, Faculty of Science and Technology, Keio University — We theoretically investigate an extrinsic spin Hall effect in semiconductor heterostructures due to the scattering by an artificial potential created by a single antidot, STM tip, etc. The strength of the potential is electrically tunable. First, we formulate the spin Hall effect in terms of phase shifts in the partial wave expansion for two-dimensional electron gas. For scattered electrons in θ direction, we obtain a spin polarization $P(\theta)$ perpendicular to the two-dimensional plane $[P(-\theta) = -P(\theta)]$. The spin polarization $P(\theta)$ is significantly enhanced by an attractive potential when the resonant condition of a partial wave is satisfied by tuning the potential strength. Second, we study the spin Hall effect in a three-terminal device with an antidot at the junction. The conductance and spin polarization are evaluated numerically.[1] We obtain a spin polarization of more than 50% due to the resonant scattering when the attractive potential is properly tuned.

[1]M. Yamamoto and B. Kramer, J. Appl. Phys. **103**, 123703 (2008), for repulsive potential.

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