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Diode Aided Geometrical Enhancement of Magnetoresistance in Semiconductors XIAOZHONG ZHANG, CAIHUA WAN, SHAOCHU LUO, JIMING WANG, JIAOJIAO CHEN, HONGGUANG PIAO, Department of Materials Science and Engineering, Tsinghua University, China — Magnetoresistance (MR) reported in some non-magnetic semiconductors particularly silicon has triggered considerable interest owing to the large magnitude of the effect. Here we showed that MR in lightly doped n-Si can be significantly enhanced by introducing a diode in the device and proper design of the carrier path [1,2]. We designed an MR device whose room-temperature MR ratio reaching 30% at 0.065T and 20000% at 1.2T, respectively, approaching the performance of commercial MR devices. We also realized MR of over 2600% in GaAs and Ge at 1.2T [2]. The MR mechanism of our devices is: The diode helps to establish a transition from low resistance state to high resistance state. In the transition region the small change in magnetic field cause a large change in MR. Because our MR device is based on a conventional Si/semiconductor platform, it should be possible to integrate it with existing Si/semiconductor devices and so aid the development of Si/semiconductor-based magneto-electronics leading to some multifunctional devices.

[1] Caihua Wan, Xiaozhong Zhang, et al., *Nature*, **477**, 304 (2011).

[2] Xiaozhong Zhang, et al. Geometrical enhanced magnetoresistance in semiconductors (in submission)

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