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Strain and Stress in nano-structure spintronics devices due to spin transfer torque. HAO YU, JUN-MING LIU, Nanjing National Laboratory of Microstructure, Nanjing, China — There have been many interests of the effect of magnetization reversal induced by current in spintronics, namely, spin transfer or spin torque effect, firstly predicted by Slonczewski and Berger in 1996. Because of the conservation of angular momentum in the spin transfer process, an additional lattice angular momentum has to be brought to balance the redundant angular momentum of the spin transfer torque. The lattice angular momentum introduces strain and stress to the nano structure of a spintronics device. In this theoretical work, we calculate the strain and stress tensors due to spin transfer in two kinds of structure: a giant magnetoresisteance (GMR) sandwich structure and a ferromagnetic nanowire. When high-density current (above some threshold value) is through them and then the named spin transfer effect occurs, the strain and stress in both longitudinal and transverse direction of the structure appear. We obtain the relationship between the strain tensors and the spin polarized current density, and sketch the diagram of the strain of the nano structures. The stain and stress produced by the spin transfer torque may introduce destructive force in spintronics devices.

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