Effects of stray field distribution generated by magnetic beads on giant magnetoresistance sensor for biochip applications

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Abstract: This study examined the effects of the stray field distribution, which depends on the relative orientation of the magnetic bead and sensor, on the sensing performance of a giant magnetoresistance (GMR) sensor for biochip applications. The beads were magnetized in two different ways: parallel and perpendicular to the sensor surface. In the case of the parallel magnetized bead, it was saturated in either the same (-x direction) or opposite (+x direction) direction to the free layer magnetization. A significant difference in the magnetization configuration of the free layer was observed with the stray field distribution. The MR values of the sensor were dependent on the stray field distribution. The largest MR value was obtained at Bpara (parallel magnetized bead in +x direction). However, the smallest MR was observed at -Bpara (parallel magnetized bead in -x direction). A moderate MR value was observed at Bperp (perpendicularly magnetized bead). The dependence of MR on the distance (h) between the bead and sensor was also different from that of the stray field: the MR values at Bpara and Bperp increase with increasing h, while MR at -Bpara decreases. © 2010 Springer-Verlag.

Author Keywords: biochip application; giant magnetoresistance sensor; Magnetic bead; stray field

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