

Controllable Magnetic Bead Motion on Patterned Magnetic Pathways for Bio Sensing Applications

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We have designed, fabricated and demonstrated a novel micro system for controllable magnetic bead motion on magnetic pathways patterned on Si substrate. Lithographically patterned soft NiFe ellipses ($9\ \mu\text{m} \times 4\ \mu\text{m} \times 0.1\ \mu\text{m}$) are arranged as pathways for transportation of magnetic beads. By the application of an external rotating magnetic field, NiFe ellipses can generate inhomogeneous stray magnetic fields due to their varied aspect ratios. The inhomogeneity in stray magnetic fields on the pathway can attract the magnetic beads on to the saturated poles of the NiFe ellipses and jump from one ellipse to another with respect to the rotating magnetic field. In the present work we have demonstrated the controllable magnetic bead (Dynabead® $2.8\ \mu\text{m}$) motion on the NiFe elliptical magnetic pathways by rotating the external magnetic field. The patterned NiFe elliptical magnetic pathways can be easily magnetized by the application of relatively weak magnetic field due to the soft nature of the material, thereby serving as a convenient template for flexible manipulation of magnetic beads for future integrated lab-on-a-chip systems for biosensing applications.

References:

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