Giant magnetoresistive biosensors for molecular diagnosis: Surface chemistry and assay development

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Abstract: Giant magnetoresistive (GMR) biochips using magnetic nanoparticle as labels were developed for molecular diagnosis. The sensor arrays consist of GMR sensing strips of 1.5 μm or 0.75 μm in width. GMR sensors are exquisitely sensitive yet very delicate, requiring ultrathin corrosion-resistive passivation and efficient surface chemistry for oligonucleotide probe immobilization. A mild and stable surface chemistry was first developed that is especially suitable for modifying delicate electronic device surfaces, and a practical application of our GMR biosensors was then demonstrated for detecting four most common human papillomavirus (HPV) subtypes in plasmids. We also showed that the DNA hybridization time could potentially be reduced from overnight to about ten minutes using microfluidics.

Author Keywords: Biochip; DNA microarray; Giant magnetoresistance; HPV; Immobilization; Surface chemistry

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