

Magnetic Force-based Immunochip using Superparamagnetic Nanoparticles

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Abstract

This paper reports a novel magnetic force-based microfluidic immunoassay using microbeads and magnetic nanoparticles. The magnetic force-based immunoassay was devised first and successfully applied to detect the rabbit IgG as the model analyte of microfluidic sandwich immunoassay.

The microchannels were fabricated by poly(dimethylsiloxane) (PDMS) molding processes and bonded on a slide glass by plasma treatment. At the part of the inlet, sample solution was hydrodynamically focused. The focused microbeads of sample solution were flowed through the 105 μm width channel of outlet. However, when the microbeads are conjugated with the superparamagnetic nanoparticles under the applied magnetic fields, they will switch their flow path and flow through the 95 μm width channel of outlet.

The movements of microbeads conjugated with magnetic nanoparticles were demonstrated by magnetic field gradients.¹⁾ High magnetic field gradients using micro electromagnets could be applied to this detection method for high sensitivity and lower detection limit. In addition, the multiplexed immunoassay²⁾ using an encoded microbead which is immobilized with a certain antibody could be possible using this detection principle.

References

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