課題番号 :F-15-UT-0069
利用形態 :機器利用
利用課題名(日本語) :
Program Title (English) :A Microfluidic Chip Coupled with Magnetophoretic and Dielectric Forces for Separating Malariainfected Red Blood Cells
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1. 概要(Summary)

This paper presents a new technique for separating malaria-infected red blood cells (iRBCs) from healthy red blood cells (hRBCs) using a microfluidic chip. In the chip, a patterned nickel thin-film layer acts as ferromagnetic wires and comb-shaped electrodes at the same time. Those components are used to respectively generate magnetophoretic (MAP) and dielectrophoretic (DEP) forces, simultaneously. From experiments using magnetic and polystyrene beads, it was shown that magnetic beads were attracted to the floor while plastic beads were levitated above as expected when both forces were applied.

2. 実験(Experimental)

【利用した主な装置】

高速大面積電子線描画装置

【実験方法】

A nickel thin-film layer is patterned on the floor of microchannel to function as both ferromagnetic wires and comb-shaped electrodes at the same time to reduce system complexity. The wires are used to induce strong gradients of magnetic field for effective MAP while the electrodes are employed to create DEP.

3. 結果と考察(Results and Discussion)

When only MAP was applied, magnetic beads were attracted to the floor, and most of them were held at the edges of the electrodes (Figs. 1a-b). When only DEP was applied, plastic beads were repelled from the floor (Figs. 1c-d). The absence of DEP caused most beads to fall onto the floor (Fig. 1c). The experiments with mixed beads were conducted (Fig. 1e). When both MAP and DEP were applied simultaneously, magnetic beads were attracted to the floor while plastic beads were levitated above (Fig. 1f). The present results suggested the possibility to apply this technique to separate two different samples with different magnetic and dielectric properties. Experiments using real blood samples were also conducted.

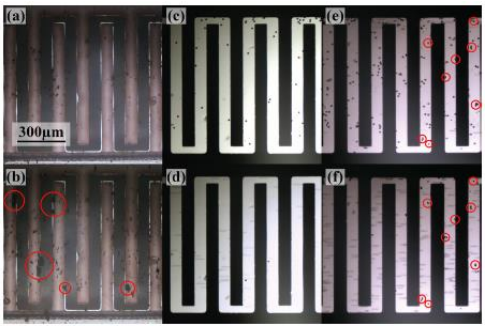

Figure 1: Captured images from the experiments.

4. その他・特記事項(Others)

なし

5. 論文・学会発表(Publication/Presentation)

・J. Buranapong, A. Pimpin, W. Srituravanich, Y. Suzuki, "A Microfuidic Chip Coupled with Magnetophoretic and Dielectrictrophoretic Forces for Separating Malariainfected Red Blood Cells," 19th Int. Conf. on Miniaturized Systems for Chemistry and Life Sciences, Gyeongju, Korea, Oct. 25-29, 2015.

6. 関連特許(Patent)

なし