

介电泳芯片的研制及不同细胞介电分离的应用

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摘要:

制备了包括指状交叉、城墙状和梯形的微电极阵列芯片装置。并用这些芯片探索了生物细胞的介电响应。另外观察了酵母和鸡血红细胞的迁移、旋转和融合以及几种细胞收集图片。发现了两种细胞的正、负介电泳现象, 确定了这两种细胞的分离条件。讨论了两种细胞正、负介电泳的原因。利用同一芯片在相同的条件下一种细胞移向强场区(正介电泳), 另一种细胞移向弱场区(负介电泳)。因此可用同一芯片分离不同的细胞。有望建立一种非接触式细胞分离技术, 而且在分离过程中不需要添加任何试剂。

关键词: 介电泳; 芯片; 细胞分离; 电极阵列

Preparation of Chips for Dielectrophoresis (DEP) and Application in Separation of Different Cell Types by DEP

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Abstract:

A series of microchip devices including castellated interdigitated, intercastellated and trapezoid electrode arrays has been fabricated based on dielectrophoresis (DEP). The dielectrophoretic response of biological cells has been explored mainly using this kinds of microchip. The relationship between three parameters (buffer conductivity ($\mu\text{s}/\text{cm}$), applied voltage (V) and frequency (Hz)) and the total number of cells has been discussed. In addition, linear motion, rotation, cell fusion and several collection patterns of yeast cells and chicken red blood cells have been observed. Both positive and negative DEP for these cell types were found and suitable conditions for separating these two types of cells have been determined. The reasons underlying positive and negative dielectrophoresis of biological cells are also discussed. Under the same conditions using the same microchip, we found that cells of one kind moved to the region with a strong electric field (positive DEP), while cells of the other kind moved to the weak electric region (negative DEP). It was thus possible to separate different cells using the same microchip. A separation technique of deferent cells without contact could be set up, with which no reagents need to be added.

Keywords: dielectrophoresis; microchip; separation of cells; electrode array

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