

一种用于生化传感检测的压电式行波微流泵的研究

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摘要:

为了减少生化传感器中样品的消耗, 基于行波原理, 本文设计了一种新型的压电式微流泵。首先, 理论证明了行波的产生机理, 并用流体仿真软件Fluent进行了验证; 其次, 设计并制作了锯齿沟道和直沟道两种结构的微流泵, 在压电双晶片阵列的驱动下, 测量了这两种微流泵在不同频率和电压下的特性。结果表明锯齿形沟道结构的压电式行波微流泵性能更优良, 在幅度为26V, 频率为1437Hz, 占空比为1的方波驱动下, 它的最大流速和最大背压分别是33.36 μ l/min和1.13KPa, 能够满足生化检测中动力输送要求。

关键词: 生化传感测量, 微流泵, 行波, 压电双晶片, 锯齿沟道

Study of Traveling Wave Piezoelectric Micropump Used for Biochemical Sensing Detection

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Abstract:

Based on the theory of traveling wave, a new piezoelectric micropump is presented in this paper to reduce the sample. Firstly, the principle of traveling wave is proved and simulated by Fluent software. Secondly, two different micropumps with straight microchannel and saw-tooth microchannel are designed and fabricated. Driven by piezoelectric actuator array and home-made circuit, the characteristics of the two micropumps are tested at different frequencies and applied voltages. Result shows that the micropump with a saw-tooth microchannel has a better performance, which has the maximum flow rate of 33.36 μ L/min and back pressure of 1.13KPa under square signal with amplitude of 26V, frequency of 1437Hz and 1:1 duty ratio, the micropump can satisfy the power transportation in biochemical detection.

Keywords: biochemical sensing detection, micropump, travelling wave, piezoelectric bimorph, saw-tooth microchannel

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