URN etd-0407109-183709-669
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Statistics This thesis had been viewed 58 times. Download 0 times.
Department
Year 2003
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Design and Fabrication of Surface Tension Driven Micro-channel Valve System for Biochip
Date of Defense 0000-00-00
Page Count 87

Keyword
surface tension
microchannel
Bio-chip
MEMS

Abstract
These researches study the design and fabrication of passive valve in microchannel, used in Biochip. The objective was to vary the capillary force by changing the geometry of microchannel for liquid flowing in or stopping in the passive valve. The items studied are: （I） Design of microchannel and passive valve,（II） Fabrication of microchannel from different method,（III） Simulation of flow phenomenon by commercial software CFDRC,（IV） Test the working effects of passive valve,（V） Attempting for Electro-wetting on Dielectric(EWOD) drive methods that drive the liquid stopped by passive valve to flow forward again.

From literature report, microchannel abrupt enlargement can stop liquid flow that served as passive valve. For a specific size of microchannel, it has a critical enlargement angle, which provides enough capillary barrier to stop the liquid flow in the microchannel. In this research, the passive valves with two different enlargement angle were studied one was less than critical enlargement angle the other was greater than the critical enlargement angle.

The fabrication of microchannel was tried to make from different materials, such as PDMS、PMMA、SU8 and glass slides. Finally, the low price glass slides were chosen as microchannel substrate in this research. Using Cr and Au to make etching mask and choosing S1818 as photoresist, the microchannel and passive valve were made by lithography process. The etching solution of HF: HCL = 3: 1 provides the best etching rate and creates the most smooth microchannel from many experiments. The channel depth of 150μm was reached.

The flow simulation conducted by CFDRC was based on the real microchannel geometry and with the real contact angle (35˚) measurement from DI water on the channel surface. The flow simulations showed that there is a negative pressure zone in front of liquid when flowed into passive valve with enlargement angle less than critical enlargement angle; however there is positive pressure zone in front of liquid when flowed into passive valve with enlargement angle greater than critical enlargement angle. This trend is in good agreement with theory.

In the real test, the DI water was dripped into the microchannel. The liquid will not stop by passive valve when enlargement angle less than critical enlargement angle, and the liquid will stop in passive valve when enlargement angle greater then critical enlargement angle. These results are in good agreement with theory and computer simulation.
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Files No Any Full Text File.
Date of Submission 2004-08-09