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Abstract

Due to the recent development of Micro Electro Mechanical System (MEMS) technology, the fabrications of microfluidic device become possible. While fluid flow in the macro system, the inertia force and gravitational force are dominant forces, the surface tension force is usually neglected. However, in micro fluid system, the surface tension is significant and meaningful. This research uses the surface tension to drive the fluid in microfluidic chip and investigates the flow phenomena in relationship with the geometric changes of microchannel. The analyses were done by numerical and simulational methods. In numerical analysis, the relationship between the enlargement angle and pressure driving fluid flow in the microfluidic chip were analyzed. Under certain conditions, mainly because of the enlargement angle of microchannel, the fluid flow would stop at suitable position inside of microchannel, which could form as a valve for sample fluid for further treatments such as mixing or heating in microfluidic system. After the numerical analysis, the design parameters, which will support geometric design of microchannel, were obtained. In the simulation, a two dimensional model of the microchannel was established and changed the geometry and dimensions, including the enlargement angle and area of microchannle, to simulate the effects of surface tension and fluid flow in the microfluidic chip. In the future, use the MEMS technology to manufacture the microchannels of biochip, which included various geometric forms, and then injected the fluid into the microchannels to test the effect of fluid flow with microchannel geometry.

Key words: Micro Electro Mechanical System, surface tension, microchannel, enlargement angle, microfluidic chip
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