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Abstract
This research studied the design and fabrication of microchannel system, used in biochip by MEMS techniques. The objective of the experiment is to push micro–liquid pass through passive valve by light actuated method. The items studied are: （I） Design of microchannel and passive valve geometry,（II） Fabrication of microchannel from different method,（III）Fabrication of TiO2 Thin-film at low temperature by sputtering technique,（IV）Test the working effects of passive valve,（V）Attempting for light actuated method to drive the liquid stopped by passive valve to flow forward again.
From the literature report, abrupt enlargement, served as passive valve, in microchannel can stop liquid flow driving by capillary force. According to this principle, the passive valves, with different enlargement angles, and different materials of microchannel walls (glass or SU–8), were designed and fabricated for discussing the liquid stopping effect. Besides, the feasibility of light actuated passive valve was studied by sputtering a thin–film of TiO2 on the bottom of passive valve, while thin–film surface accepting UV–light irradiation (380nm), it could change the contact angle between fluid and channel wall, and then makes the fluid flow forward again. This could be used to handle microliquid inside of microchannel.
The fabricated microchannels with the diameter ranges within 100 to 500μm (SU–8 channel: 100μm, 300μm, glass channel: 300μm, 500μm). The maximum depth of channel is 150μm, and the average depth is approximately 100μm. The sputtered TiO2 thin–film is manufactured by the following parameters: temperature at 33℃，RF power at 80W，and chamber pressure at +0.053Pa. The DI water was used in microliquid handling experiment, the results showed that the passive valve with enlargement angle of 40°could stop the fluid flow in the microchannel. According to the calculation of the mathematical formula, the critical enlargement angle is 30.2°.The experiment result is in agreement with analytical result. The test of light actuated microliquid, passing through passive valve (test chip No.bio–002), was conducted on the passive valve, with enlargement angle of 40°, which stopped the liquid flow, and then use mercury light, with power of 11.09E–3 W/cm2, and wave length of 386nm UV–light, to irradiate on the TiO2 thin–film at the bottom of the passive valve. The results showed the irradiated TiO2 thin–film, after 1.5 to 3 minutes, can change the contact angle of the stopped microliquid in the passive valve, and make the liquid to flow forward again. It is

successfully demonstrated feasibility of UV–light actuated passive valve, which could be applied in microliquid handling. Finally, this research proposed several kinds of microfluidic chips, which is attempt to do bio–liquid analysis and measurement, combined with Lab View software, on the chip in the future .
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