

## THE DEVELOPMENT OF A DROPLET QUANTITY LIQUID PREPARATION SYSTEM

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We developed the pump and valve unit of a low price to use for the micro fluidics operation. The purpose of our study is to develop a new liquid-delivery system, which is capable of generating highly accurate and reproducible micro-flows and nano-flows for capillary on a chip without the use of any flow splitter.

In our previous development, we proposed a channel structure to which a hydrophobic passive valve was introduced. With this method, the sample injection of certain exact volume was realized with high reproducibility. However, this system requires a relatively delicate control of the pneumatic pressure for avoiding the incorporation of air bubble which disturbs the reproducible separation. Therefore, we developed the pump which could control the low pressure not to cause a pulsation. And the development of the pump is necessary for us to automate this technology too.

This pump has two outlets to function independently and there are the three kinds of modes to liquid-delivery control. 1) The range of flow-rate is 0.01-600  $\mu$ l/min. 2) Limits of the pressure control are positive pressure 0-150KPa and negative pressure -50-0KPa. 3) The range that a fixed quantity can be controlled is 0.01-100  $\mu$ l. And, this three mode can control suction and discharge. Therefore, these outlets can choose one function over six functions.

Furthermore, this pump is equipped with outlet of four that individually function by the pressure control method. These outlets are composed of the control mechanism by positive pressure (0-150 KPa: two outlets) and negative pressure (-50-0 KPa: two other outlets). And these outlets can control the atmosphere release, a pump connection, the condition maintenance, and so on by eight solenoid valves.

We used function of this pump for our flow-injection system. We succeeded in making liquid-droplet of 1.8 nl automatically by use of structure which we proposed and this pump. Furthermore, we checked balance of the flow by Y-shaped micro-channel. The flow control of this pump was perfect.

We started sales in JAPAN at 2004 at a price of about \2,000,000 (about \$18,000). Anybody can use the liquid-droplet of a small quantity if the structure which we proposed and this pump are used.

This technology is available for the sample injection of the micro-electrophoresis and the mixing method of a droplet quantity liquid.

Like this, the development of this technology will promote a post-genome-analysis such as phamaco-genomics and proteomics.