

# Design and fabrication of laminated piezoelectric micropump with check valve

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## ABSTRACT

The main function of the micropump system was to be able to precisely control the minimum flow rate. The research applied laminated technique to assemble processed acrylic part, valve and piezoelectric actuator according to predetermined sequences. In this paper, the micropump was designed two kinds of valves, which contained different material and structure. The type I was a Ni material which equipped with four bridged structures by electroforming. And the type II was a polymer PDMS material which design of cantilever beam by casting. After assembly, the flow and related tests will be preceded. The main focus of this paper was to discuss how different types of valves, being operated under all kind of frequency and voltage, to affected the micro bump flow rate and blocked pressure. Two valves assembled by the same piezoelectric actuator served as the subjects for further analysis and the result showed that Ni valve would be able to reach the maximum flow rate of 48.06 ml per minute when it was 20  $\mu$  m in thickness and the micropump's operational voltage and frequency were at 160 Vpp and 30 Hz. Moreover, the maximum blocked pressure would be able to reach 7.5 kPa. The PDMS valve would be able to reach the maximum flow of 58.66ml per minute when it was 600  $\mu$  m in thickness and the micropump 's operational voltage and frequency were at 160 Vpp and 30Hz. In addition , the maximum blocked pressure would be able to reach 12kpa.

Keywords : Laminated、Micropump、Valve、Piezoelectric、Electroforming、PDMS

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