

Development of a New Piezoelectrically Actuated Micropump for Liquid and Gas

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Abstract : This paper aims to present the design, fabrication and test of a novel piezoelectric actuated, check-valves embedded micropump having the advantages of miniature size, light weight and low power consumption. This device is designed to pump gases and liquids with the capability of performing the self-priming and bubble-tolerant work mode by maximizing the stroke volume of the membrane as well as the compression ratio via minimization of the dead volume of the micropump chamber and channel. By experiment apparatus setup, we can get the real-time values of the flow rate of micropump, the displacement of the piezoelectric actuator and the deformation of the check valve, simultaneously. The micropump with check valve 0.4 mm in thickness obtained higher output performance under the sinusoidal waveform of 120 Vpp. The micropump achieved the maximum pumping rates of 42.2 ml/min and back pressure of 14.0 kPa at the corresponding frequency of 28 and 20 Hz. The presented micropump is able to pump gases with a pumping rate of 196 ml/min at operating frequencies of 280 Hz under the sinusoidal waveform of 120 Vpp.

Keywords : actuator, check-valve, micropump, piezoelectric

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