Design and Fabrication of Piezoelectric Actuated Micropump with Check Valve and Application to Electronic Cooling

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ABSTRACT

In recent years, electronic products in the continuous improvement in performance. This trend urges the heat sink of electronic chip to become gradually important, and then that will develop many type of heat sink, which is water cooling system. This study aims to demonstrate the performance of the piezoelectric actuated micro-pump with check valve and their applications in Personal Computer cooling. This project aims to present the design, fabrication and test of a novel piezoelectric actuated, check-valves embedded micro-pump having the advantages of miniature size, light weight and low power consumption. The micropump consists of a piezoelectric actuator, a stainless steel chamber plate with membrane, an acrylic channel plate with two valve seats, and two cantilever-type PDMS-made check valves. 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 micro-pump chamber and channel. And explore the driving to voltage, operating frequency of piezoelectric dynamic flow valve micropump with the displacement. Find the maximum flow rate and maximum back pressure with the heat sink to achieve the best thermal design.

Keywords : micro-pump、check valve、piezoelectric actuator、electronic cooling

Table of Contents

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