壓電致動有閥微泵浦之特性研究

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摘 要

本論文所設計之微泵浦具有雙出入水口的特性，此設計使得液體流量大幅地提升。微泵浦利用壓電材料做為致動器，不鏽鋼蝕刻的艙體層，以及使用壓克力材料具有流道、閥座結構之流道層，還有最主要利用聚二甲基矽氧烷製作出的單向止回閥，將以上元件加以組裝即為新型壓電致動有閥微泵浦，其具有微小化、質量輕及低消耗功率等優點，後面將針對此微泵浦系統之性能深入探討研究。從實驗結果得知，微泵浦之性能會受到驅動頻率、驅動電壓、艙體深度、閥體厚度、流道大小、不同背壓所影響。當驅動電壓在160 Vpp，微泵浦搭配流道2.0mm、艙體深度300μm以及閥體厚度0.5mm使用時有最大液體流量125.6ml/min，當微泵浦搭配流道1.0mm、艙體深度300μm以及閥體厚度0.5mm使用時有最大空氣流量102.2ml/min。

關鍵詞 : 壓電、致動器、PDMS、單向閥

目錄

參考文獻

[1]F. C. M. van de Pol,“ A pump based on micro- engineering techniques, ” Ph. D. thesis, Enschede, the Netherlands: University of Twente, 1989.

[2]A. Olsson, G. Stemme, and E. Stemme,“ Numerical and experimental studies of flat-walled diffuser elements for valve-less micropumps, ” Sensors and Actuators A: Physical, vol. 84, pp. 165-175, 2000.

[3]R. Linnemann, P.Woias, C.-D. Se&, and J. A. Ditterich,“ A self-priming and bubble-tolerant piezoelectric silicon micropump for liquids and gases, ” 1998 IEEE, pp. 532-537, 1998.

[4]S. Guo, S. Hata, K. Sugumoto, T. Fukuda and K. Oguro,“ A New Type of Capsule Micropump Using ICPF Actuator, ” Micromechatronics and Human Science, 25-28 Nov, pp. 255-260, 1998.

[5]Sebastian Bohm, Wouter Olthuis, Piet Bergveld,“ A plastic micropump constructed with conventional techniques and materials, ” Sensors and

Actuators A: Physical, Vol. 77, Issue 3, pp. 223-228, 1999.
[6]J. Shinohara, M. Suda, K. Furuta, T. Sakuhara, “ A high pressure-resistance micropump using active and normally-closed valves, ” Micro Electro Mechanical Systems, 23-27 Jan, pp. 86-91, 2000.
[7]Nam-Trung Nguyen, Thai-Quang Truong, “ A fully polymeric micropump with piezoelectric actuator, ” Sensors and Actuators B: Chemical, Vol. 97, Issue 1, pp. 137-143, 2004.
[8]Junhui Ni, Bin Wang, Beizhi Li, Qiao Lin, “ A planar PDMS micropump based on in-contact low-leakage check valves, ” Nano/Micro Engineered and Molecular Systems (NEMS), 20-23 Jan, pp. 608-611,2010.
[9]許廷妤, “ 壓電致動有閥微泵浦之設計與製作 ”, 大葉大學機械與自動化工程學系碩士論文, 2010.