## **Recent Development of PZT micropumps and their Applications**

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## Abstract

The results of the study on two types of PZT micropump, obstacle-type and reciprocating-type, are presented. These micropumps were made through a MEMS fabrication process by using simply only one or two photo mask. In obstacle-type valveless micropump, asymmetric obstacles are used for the flow directing device instead of the diffuser/nozzle elements in previous studies. The main feature of the present micropump is that it has a uniform cross-section area across the micro-channel, which is very favorable for the portable microfluidic systems. In reciprocating-type micropump, the fluids were easily driven by a PZT plate and net flow was directed toward the outlet after rectification by two planar passive valves. We also report the coupling effects between the valve motion and the flow behaviors, which were studied using a micro-PIV technique. The micropump was uniquely characterized by the existence of a linear relationship between the flow rate and the driving frequency, which enabled this micropump to be easily operated and controlled.

## **Bibliography**

Horn-Jiunn Sheen was born in Tainan in 1957. He received the B.S. degree in Power Mechanical Engineering from National Tsing-Hua University in 1978, and the M.S. degree and the Ph.D. degree in Mechanical Engineering from State University of New York at Stony Brook in 1983 and 1987, respectively.

He was an Associate Professor from August 1987, and has been a Full Professor from August 1998 in the Institute of Applied Mechanics, National Taiwan University. From October 2002 to July 2004, he was the Director of Center for Teacher Education (CTE), National Taiwan University. From August 2004 to December 2006, he was the Director of the North K-12 Regional Center of Nano-technology Human Resource Development Program (NHRD), Advisory Office, Ministry of Education. Starting from September 2006, he is the Director of the Nano-Electro-Mechanical-Systems (NEMS) Research Center, National Taiwan University. He has experience in teaching the courses of Applied Mechanics Experiments, Electronic Experiments, Experimental Fluid Mechanics, Fluid Mechanics I, Viscous Flows, Turbulence, Engineering Mechanics, and Mechanics of Materials. His research interests are micro-electro-mechanical system (MEMS), micro-channel flows, bio-sensors, two-phase flows, optical measurement techniques, separated flows, and swirling flows.