

On-Chip Integratable Elastomeric Dome Valves for Glass Microfluidic Systems

Song-I Han, Youngdo Jung¹, Ki-Ho Han* and Albert Bruno Frazier¹

School of Nano Engineering, Inje University, 607 Obang-dong, Gimhae,
Gyongnam 621-749, Republic of Korea

¹School of Electrical and Computer Engineering, Georgia Institute of Technology,
777 Atlantic Drive, Atlanta, GA 30332-0250, USA

(Received July 2, 2007; accepted November 9, 2007)

Key words: microvalve, fluid-control device, microfluidic system, microfabrication, stereolithography

In this paper, we present a methodology for realizing integrated, pneumatically controlled dome valves for use with glass microfluidic systems. The dome valves were fabricated by attaching a microfluidic system interface (MSI), manufactured by stereolithography, to a glass microfluidic system. Both normally open and normally covered types of dome valves were designed to have a low dead volume of 12 nl. The results show that the normally open dome valve was closed at valve pressures greater than 150 kPa, and that the normally covered dome valve was opened when the fluid pressure was 7 kPa higher than the valve pressure. Experimental results showed that the fluid pressure that resulted in leakage increased linearly with increasing valve actuation pressure from 0 to 450 kPa. We have demonstrated that the dome valves are practical fluid-control elements for use with glass microfluidic systems.

*Corresponding author: e-mail: mems@inje.ac.kr