

MICROFLUIDIC LARGE SCALE INTEGRATION

Abstract

Using basic physical arguments, a design and method for the fabrication of microfluidic valves using multilayer soft lithography is presented. Embodiments of valves in accordance with the present invention feature elastomer membrane portions of substantially constant thickness, allowing the membranes to experience similar resistance to an applied pressure across their entire width. Such on-off valves fabricated with upwardly- or downwardly-deflectable membranes can have extremely low actuation pressures, and can be used to implement active functions such as pumps and mixers in integrated microfluidic chips. Valve performance was characterized by measuring both the actuation pressure and flow resistance over a wide range of design parameters, and comparing them to both finite element simulations and alternative valve geometries.

Fig. 37B