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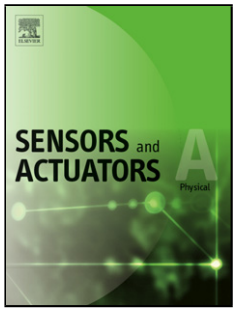

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Biocompatible Compact Micropump with Integrated Unidirectional Microvalves for Low Pressure Microfluidic Applications

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Abstract

In this paper we present a new architecture of miniaturized micropump intended for drug delivery and low pressure biomedical applications. The analyzed micropump is fabricated with rapid casting of sugar glass. A custom sugar glass 3D printer was used for the negative template of the micropump. The main advantage of the developed system is its low complexity with embedded microvalves at the inlet and outlet ports where the only moving part of the micropump is the pumping membrane. Two membrane fabrication techniques have been tested, *i.e.* 3D printer based approach and spin-coating technique. Several structural configurations of the system have been investigated and discussed such as the number of membranes, their thickness and thickness of the cantilevers, which form the microvalve. Results showed that the proposed structure is robust and the maximum pressure supported by embedded microvalves is 69 kPa. The maximum and stable measured flow rate was 7 $\mu L/min$ with 114 mW as power-supply. Overall dimensions of the complete system are 20 mm × 20 mm × 10 mm with a pumping chamber volume of 31 mm^3.

Keywords: Micropump, Microfluidics, Microvalves, 3D printing, Rapid Casting.

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