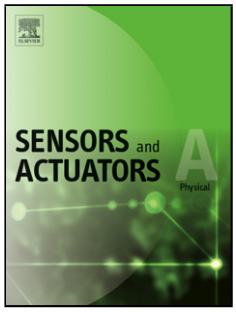

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PII: S0924-4247(18)30212-7
DOI: https://doi.org/10.1016/j.sna.2018.04.042
Reference: SNA 10755

To appear in: *Sensors and Actuators A*

Received date: 8-2-2018
Revised date: 18-4-2018
Accepted date: 26-4-2018

Please cite this article as: Kim H, Hwang H, Baek S, Kim D, Design, Fabrication, and Performance Evaluation of a Printed-circuit-board Microfluidic Electrolytic Pump for Lab-on-a-chip Devices, *Sensors and Actuators: A. Physical* (2010), https://doi.org/10.1016/j.sna.2018.04.042

Design, Fabrication, and Performance Evaluation of a Printed-circuit-board Microfluidic Electrolytic Pump for Lab-on-a-chip Devices

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Keywords: PCB, Micropump, Lab on a chip, Electrolysis, Microfabrication, Interdigitated Electrode

Highlights

- An electrolytic micropump based on PCB technology for portable lab-on-a-chip devices is designed, fabricated, and characterized.
- A theoretical model for power consumption of an electrolytic micropump as a function of interdigitated-electrode geometry is proposed and is experimentally verified.
- Flow rate and backpressure of the micropump are measured as a function of current using custom-built jigs and experimental setups.
- The micropumps based on PCB electrode chips are thoroughly compared with the micropump made using conventional microfabrication processes in terms of pumping performance, power consumption, lifetime and cost.
- The micropump based on a PCB chip with electroplated gold electrode yields exceptionally high flow rate up to 31.6 ml/min and backpressure up to 547 kPa, indicating outstanding pumping performance.

Abstract

We report *for the first time* an electrolytic micropump based on an electrode chip fabricated on a printed circuit board (PCB), and compare its performance with that of a micropump based on an electrode chip fabricated using conventional microfabrication. Gold interdigitated (IDT) electrodes are patterned on a PCB to minimize ohmic loss during electrolysis. Custom-built acrylic fixtures are used to characterize pumping performance of various electrode chips with different electrode