Novel Integrated Micropump for High-Throughput DEP-based Microfluidics

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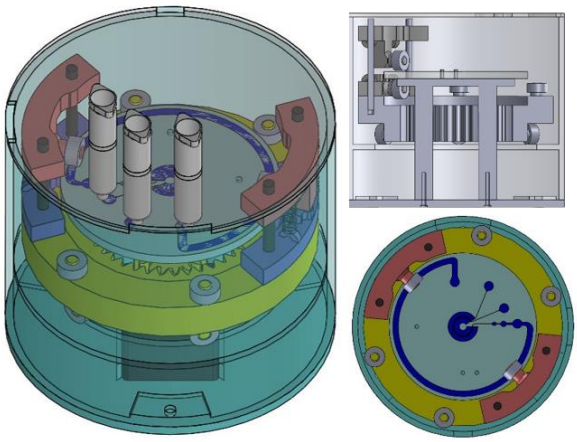
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Keywords: Micropump, microfludics, Lab on a Chip, Dielectrophoresis

I. Abstract

In microfluidics, most widely used pumping methods are conventional syringe pumps or inflexible, large laboratory devices. These devices' cumbersome structures shortage the improvement of compact Lab-on-a-Chip (LoC) systems. In this study, we designed and fabricated a portable, easy-to-use peristaltic micropump, which can be integrated to diverse microfluidic applications. The 3D-printed micropump body bears a reprogrammable stepper motor, which is an actuator. The rotation of the motor is then transmitted by a gear mechanism to the roller bearings that create the peristaltic deformation on the disposable PDMS channel. Compression of the roller bearings on the pump channel are generated using spring-rod system, which enables simple replacement of LoC systems. The mentioned LoC system is made of single-use PDMS and contains circular pump channel. While present designs only enable non-external force field required microfluidic applications, this novel design can be equipped with any other external force sources depending on the target such as electrical based applications since the mechanism leaves an empty volume below the LoC pattern. As an application, we have developed a tiny signal generator, which is also reprogrammable, and fitted it into the pump, then we integrated the micropump with three-dimensional flexible electrodes into high throughput dielectrophoretic chip for rare cell enrichment. The pump has the features of portability, repeatability and multi-purposeness, it simplifies diagnosis procedures cost-effectively. Therefore, it enables people the use of LoC devices for point-of-care (PoC) applications in the field as well as for laboratory applications with easiness.

II. Image:



III. Reference:

1. Zhang, X., & Huang, Y. (2015). A valve-less microfluidic peristaltic pumping method. *Biomicrofluidics*, *9*, 014118.

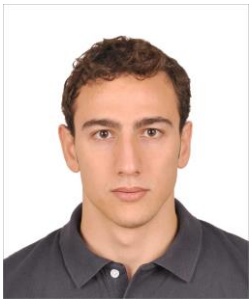
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IV. Biography:

Berke Erbas was graduated from Notre Dame de Sion French High School. He is expected to be graduated from Mechanical Engineering Department ın Fall-2018 from Istanbul Technical University (ITU). He is a member of MEMS Research Center at and he has worked on PDMS-based microfluidics.

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Session name/ number: Lab-on-a-chip Technology/Track 9
Category: Poster presentation
Passport Number: U 14899733