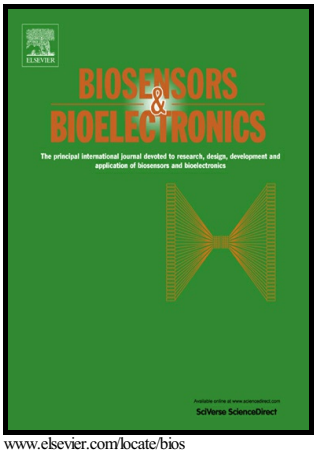

www.elsevier.com/locate/bios

Microfluidic Integrated Acoustic Waving for Manipulation of Cells and Molecules

Alireza Barani, Hossein Paktinat, Mohsen Janmaleki, Aminollah Mohammadi, Peiman Mosaddegh, Alireza Fadaei-Tehrani, Amir Sanati-Nezhad

PII: S0956-5663(16)30487-0
DOI: http://dx.doi.org/10.1016/j.bios.2016.05.059
Reference: BIOS8749

To appear in: *Biosensors and Bioelectronic*

Received date: 20 March 2016
Revised date: 13 May 2016
Accepted date: 19 May 2016

Cite this article as: Alireza Barani, Hossein Paktinat, Mohsen Janmaleki Aminollah Mohammadi, Peiman Mosaddegh, Alireza Fadaei-Tehrani and Amir Sanati-Nezhad, Microfluidic Integrated Acoustic Waving for Manipulation of Cells and Molecules, *Biosensors and Bioelectronic* http://dx.doi.org/10.1016/j.bios.2016.05.059

Microfluidic Integrated Acoustic Waving for Manipulation of Cells and Molecules

Alireza Barani[a], Hossein Paktinat[b], Mohsen Janmaleki[c,d], Aminollah Mohammadi[a], Peiman Mosaddegh[b], Alireza Fadaei-Tehrani[a], Amir Sanati-Nezhad[c,d*]

[a] *Department of Mechanical Engineering, Isfahan University of Technology, Isfahan, Iran*

[b]*Department of Mechanical Engineering, Najafabad Branch, Islamic Azad University, Najafabad, Iran*

[c]*BioMEMS and Bioinspired Microfluidic Laboratory, Department of Mechanical and Manufacturing Engineering, University of Calgary, Calgary, Canada*

[d]*Center for BioEngineering Research and Education, University of Calgary, Calgary, Canada*

**Correspondence to: Amir Sanati-Nezhad, BioMEMS and Bioinspired Microfluidic Laboratory, Department of Mechanical and Manufacturing Engineering, Schulich School of Engineering, University of Calgary*

EEEL 455B, 2500 University Drive NW, Calgary, Alberta T2N 1N4 Tel: +1(403) 220-7708

E-mail address: amir.sanatinezhad@ucalgary.ca

ABSTRACT

Surface acoustic wave (SAW) technology with its simple and low-cost fabrication, rapid and localized fluid actuation, compatibility with microfluidic components, and biocompatibility for cellular studies, has been extensively integrated into microfluidics to provide on-chip microdevices for a variety of applications in biology, bioengineering and chemistry. Among different applications, noninvasive manipulation of cells and biomolecules are significantly important, which are addressed by SAW-based microfluidics. Here in this paper, we briefly explain the principles and different configurations of SAW acoustic streaming for the manipulation of cells and molecules and overview its applications for single cell isolation, cell focusing and sorting, cell washing and patterning, cell-cell fusion and communication, and tissue engineering. We further discuss the application of SAW-based microfluidic systems for the mixing and transport of liquids, manipulation of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) molecules, followed by explanation on the present challenges of SAW-based microfluidics for the handling of cells and molecules, and highlighting the future directions.

Keywords: Surface acoustic wave; Microfluidics; Acoustofluidcs; Manipulation of single cells and molecules

Contents