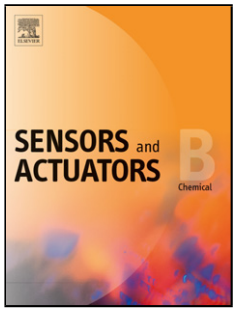

Title: A self-sufficient micro-droplet generation system using highly porous elastomeric sponges: A versatile tool for conducting cellular assays

Authors: Peter Thurgood, Sara Baratchi, Crispin Szydzik, Jiu Yang Zhu, Saeid Nahavandi, Arnan Mitchell, Khashayar Khoshmanesh

PII: S0925-4005(18)31416-3
DOI: https://doi.org/10.1016/j.snb.2018.07.168
Reference: SNB 25137

To appear in: *Sensors and Actuators B*

Received date: 21-5-2018
Revised date: 27-7-2018
Accepted date: 31-7-2018

Please cite this article as: Thurgood P, Baratchi S, Szydzik C, Zhu JY, Nahavandi S, Mitchell A, Khoshmanesh K, A self-sufficient micro-droplet generation system using highly porous elastomeric sponges: A versatile tool for conducting cellular assays, *Sensors and amp; Actuators: B. Chemical* (2018), https://doi.org/10.1016/j.snb.2018.07.168

A self-sufficient micro-droplet generation system using highly porous elastomeric sponges: A versatile tool for conducting cellular assays

Peter Thurgood [1,†], Sara Baratchi [2], Crispin Szydzik [1], Jiu Yang Zhu [1], Saeid Nahavandi [3], Arnan Mitchell [1], Khashayar Khoshmanesh [1,†]

[1] School of Engineering, RMIT University, Melbourne, Victoria, Australia

[2] School of Health & Biomedical Sciences, RMIT University, Melbourne, Victoria, Australia

[3] Institute for Intelligent Systems Research and Innovation, Deakin University, Waurn Ponds, Victoria, Australia

† Corresponding

Peter Thurgood: pthurgood@gmail.com

Khashayar Khoshmanesh: Khashayar.khoshmanesh@rmit.edu.au

Highlights

- A self-sufficient droplet generation system using highly porous polymeric sponges is introduced.
- Upon manual compression, hundreds of droplets are generated with 64% of them falling in the range of 5 to 50 µm.
- Facilitates the simple encapsulation, chemical stimulation and microscopic analysis of cells inside droplets.
- Is potentially suitable for conducing cellular assays in educational and research laboratories.

ABSTRACT

Here, we present a self-sufficient droplet generation system using a highly porous elastomeric sponge. Upon manual compression, aqueous solutions can be loaded into or unloaded from the sponge. The surface of the sponge accommodates hundreds of small orifices, which facilitate generation of microscale droplets when compressed inside an oil container. The physics underlying the generation and size distribution of droplets is explored. Proof-of-concept experiments demonstrate the capability of this method for encapsulation of human monocytes inside droplets. The droplets are chemically isolated, mechanically stable, and do not evaporate due to the presence of oil in the microwell. The cells settle at the lowest surface of the droplets without using