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

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## **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  $\mu\text{m}$ .
- Facilitates the simple encapsulation, chemical stimulation and microscopic analysis of cells inside droplets.
- Is potentially suitable for conducting 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

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