# Microfluidic trap-and-release system for lab-on-a-chip-based studies on giant vesicle

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# Supplementary Information

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### Trapping of Lipid Vesicles

The lipid vesicles were formed with Egg-Phosphatidylcholine (Egg-PC) by electroformation between two ITO-coated glass slides. The glass slides were spin-coated with a solution of 5mg/mL Egg-PC in $CHCl_3$. The electroformation was done by applying a sine wave voltage during 5min at a frequency of 10Hz and an amplitude of 2V, followed by 10min at 5Hz and 4V, and 10min at 2Hz and 4V. The vesicles get efficiently trapped, similarly to polymer vesicles. However, as they deform more easily than polymer vesicles, lower flow rates have to be applied.

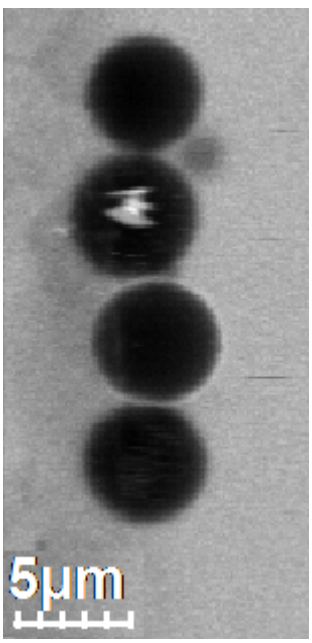


**Fig. 1** LSCM picture of trapped lipid vesicles at a flow rate of 6µL/min. The used fluorophore was Alexa-Fluor Dextran (from Life Technologies Corp.).

### Trapping of Oil-in-Water Droplets

Oil-in-water droplets could also be trapped successfully. The oil-in-water emulsion was made from a fluorinated oil ((FC3283 from 3M) and stabilized with 1wt% of sodium dodecylsulfate (SDS). The droplets resisted very high flow rates as they are physically more stable than polymer vesicles.

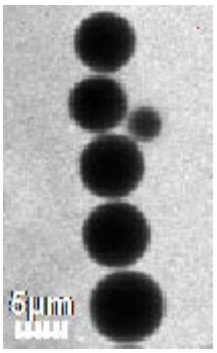

**Fig. 2** LSCM picture of trapped O/W droplets.

**Osmotic Swelling**

PBut-b-PEO vesicles were formed in a 100mM sucrose solution. The vesicles were trapped in the microfluidic device and the external phase was lowered to 75mM within less than one minute. Thanks to the device, it was possible to follow in real-time the swelling process undergone by several vesicles. A video of such a swelling process is available on the journal website.

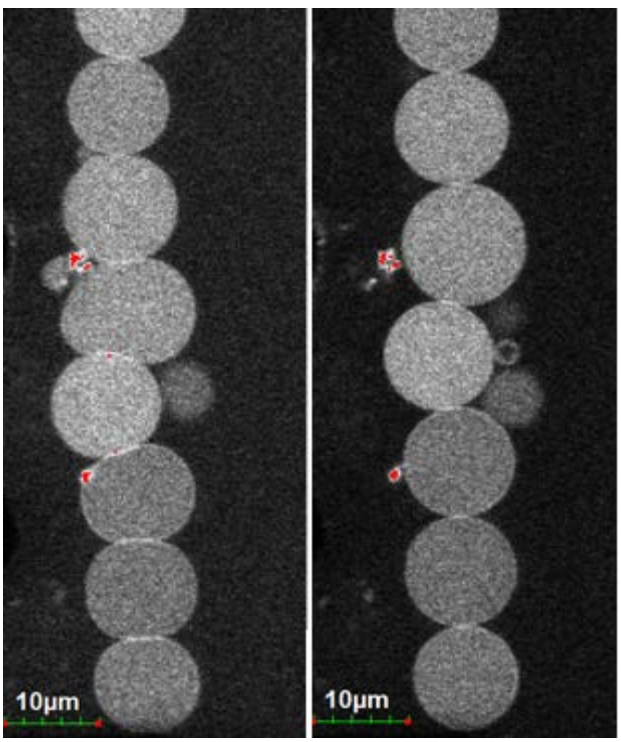


**Fig. 3** LSCM picture of trapped PBut-b-PEO vesicles. Left: vesicles before swelling. Right: Swollen vesicles, 7min after the osmotic shock. Due to osmotic swelling, only 7 vesicles can be imaged after swelling whereas 8 were visible before swelling.

**Release of Trapped Vesicles**

A video showing the release of the trapped vesicles is available on the journal website. It demonstrates how vesicles can get released and re-exited by inversing the flow in the microfluidic device.

Figure 4 shows a PBut-b-PEO vesicle that was first electroformed in a solution of 90mM sucrose and 5µM Alexa-Fluor Dextran (purchased from Life Technologies Corp.). It was then trapped in the microfluidic device, and its external phase was exchanged against a 120mM sucrose solution devoid of fluorophore. This made the vesicle shrink, which induced the formation of three invaginations. Then by applying an inversed flow it was possible to re-exit the vesicle. The epifluorescence shows that the external phase was successfully exchanged.

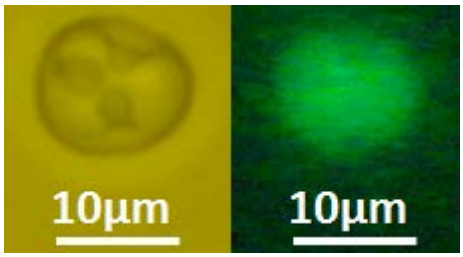


**Fig. 4** Left: phase contrast picture of a vesicle that was re-exited from the microfluidic trap device. Right: epifluorescence picture of the same vesicle.