

Field:

Medical/Neuroscience

Session Topic:

Synthetic Biology

Speaker:

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MEMS (Micro Electro Mechanical Systems) and microTAS (micro Total Analysis Systems) technologies can be powerful tools when performing high-throughput, and highly sensitive analysis with extremely small amounts of solution. When confined in a small volume, chemical reactions are easily detectable by large changes in the concentration of products; thus preparing micro-sized vessels by these technologies is getting important for the molecular/cellular analysis. Here, I will introduce these technologies based on our research results and discuss the applicability of them for synthetic biology.

Arrayed microchambers are easily produced by soft lithography using PDMS silicone rubber and can be useful for the analysis of single molecules in single cell volume. *Micro droplets* created in microfluidic devices have highly monodisperse diameters and can be handled by hydrodynamic, optical, and electrokinetic methods. This technology is also applicable for preparing cell-laden hydrogel modules that can be useful for constructing a 3D macroscopic tissue structure. *Artificial lipid bilayer array* are formed at microapertures by flowing lipid organic solution and buffer alternately into an integrated microfluidic channel. Using the technique, multiple lipid bilayers are formed simultaneously in a single chip, and channel currents through ion channels was recorded. *Monodisperse giant liposomes* (over 10 μm in diameter) that can be useful as cell models are also prepared by patterning lipid films on substrates with a dry lift-off process and subsequently applying fluidic flow or voltages between the substrates. These devices/techniques would be useful for the exhaustive analysis of cells, proteins, and cell-membranes in synthetic biology.

Reference:

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