Applied Microfluidic Systems

From Deep-Sea Application to Cell Engineering

Soft actuator
We developed an unique soft actuator based on “Microhydraulics” which uses microfluidic channels and integrated pumps to create 3D motion.

Single cell analysis
We have developed a microwell array device for parallelized single cell analysis using electrostatic functions including dielectrophoresis and electroporation.

Biochemical networks
Targeting a behavior and encoding it in DNA-based circuits, a bistable memory circuit that can be switched back and forth was demonstrated successfully.

Control of gene expression
We are developing a novel system enabling temporal control of gene expression by combining optogenetics and microfluidics.

Underwater AFM
A compact AFM system, which is mountable on underwater vehicles, is studied to investigate the nanoscopic samples in deep sea and in situ.

Cell/tissue showcasing
A cell/tissue showcase system which regulates fluidic/adhesive conditions is developed by integrating artificial bio-interface into a microfluidic device.

Compartmentalized culture
A compartmentalized culture system for cell aggregate has been developed for spatially controlled differentiation of iPSCs or anticancer drug evaluation.

Cell culture system
A microfluidic cell culture system which enables dynamic control of a signal molecule concentration has been developed for cell-signaling study.

Liver cell culture
We are developing a microfluidic device which allows generation and visualization of oxygen gradients to understand hepatic metabolism.

CTC analysis
We perform single-cell PCR and immunostaining of circulating tumor cells (CTCs) to show usefulness in diagnosis or treatment of cancer.

Microfluidics, cell engineering, underwater technology and molecular engineering