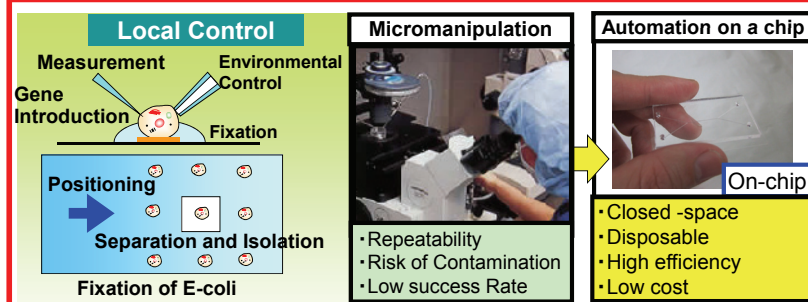


## What's New ? : Transparency Control of Gelated PNIPAAm by Microbridge

### Abstract:

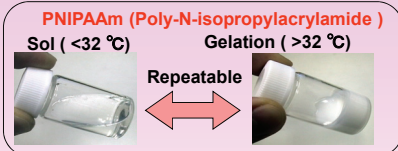
We demonstrated a temperature controlling microfluidic chip for cell immobilization using a thermo-sensitive hydrogel (PNIPAAm). The ITO (Indium Tin Oxide) microheaters perform heating of the solution of cell, PNIPAAm in microchannels. We are targeting to fabricate a **suspended microbridge above a microheater to limit the height of gel to form "thin and transparent gel layer" above the heater**. The research was focused on controlling of gel thickness which eliminated unnecessary interferences of autofluorescence of gel in the observation by the inverted microscope, and a better S/N ratio can be obtained. All the **heating and a suspended biocompatible microbridge were integrated on a chip**, in which yeast cells immobilization can be performed by the gelation of the PNIPAAm solution.

### Motivation:

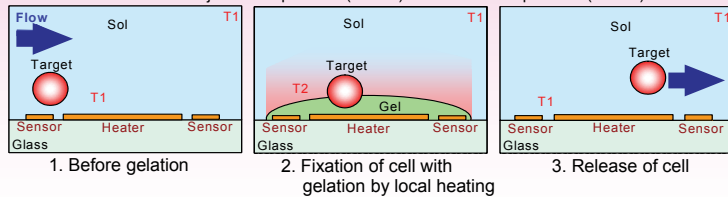


### Cell Immobilization by Thermal Gel (PNIPAAm)

• A single cell observation & culture system by thermal sol-gel transformation



T1: Coarse adjusted temperature ( 23 °C ) · T2: Heated temperature ( 35 °C )



### Conventional Temperature Control Chip

Thick gel prevents Observations !

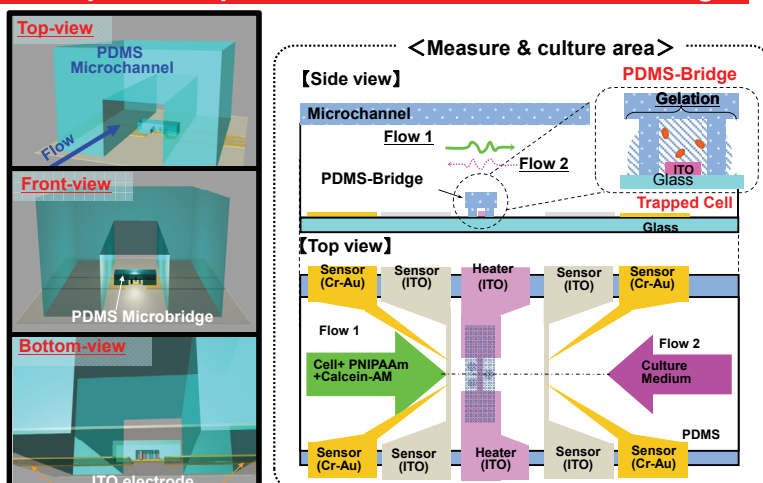
Require to **Control**

- S/N Ratio
- Gel thickness
- A number of observe cells to be trapped
- (Z-axis) Temperature distributions

**New Concept Chip**

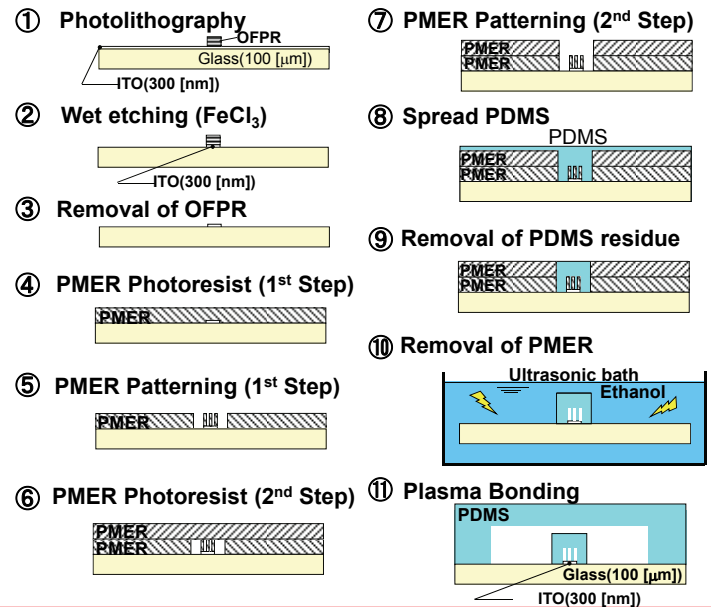
- Control the gel thickness by a microbridge fabrication on a chip
- Thin and transparent gel formation to improve the S/N ratio on observation by inverted microscope

### Concept of Temperature Control Under Microbridge



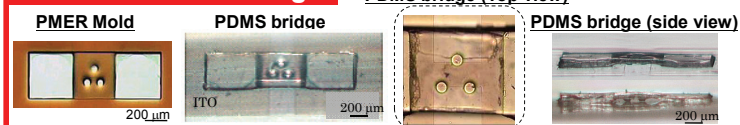
### Fabrications :

#### Fabrication of PDMS Microbridge

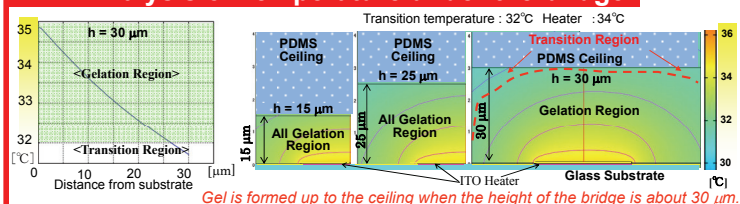


### Experiments :

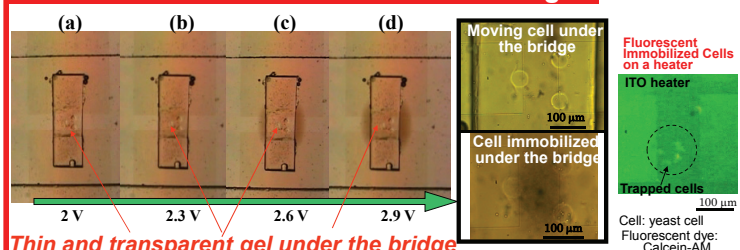
#### Fabricated Microbridge



#### FEM Analysis of Temperature under the bridge



#### Cell Immobilization under the microbridge



### Conclusions :

A temperature controlled microfluidic chip for cell immobilization using a thermosensitive hydrogel (PNIPAAm) has successfully fabricated with a novel polymeric microbridge on the substrate. The ITO microheaters performed heating of the solution of cell, PNIPAAm and Calcein-AM (fluorescent dye) in microchannels and the **immobilized cells under the microbridge was successfully observed**.

**References :** Y. Yamanishi, J. Teramoto, Y. Magariyama, A. Ishimhama, T. Fukuda, F. Arai, "ON-CHIP TEMPERATURE CONTROL UNDER SUSPENDED MICROBRIDGE FOR CELL IMMOBILIZATION AND CULTURE SYSTEM", Proc. of μ-TAS2009, pp.1683-1685, (2009).