**Addressable Fluidic Gate Arrays for Layer-to-Layer Parallel Fluidic Transportation System**

**Abstract**
We present addressable fluidic gate arrays for layer-to-layer parallel fluidic transportation system. Presented addressable fluidic gate is composed of double-valves driven by pneumatic pressure. One of the double-valves is controlled by row channel and the other is controlled by column channel for row/column addressing. The layer to layer transportation makes it possible to collect targeted samples from a testing well plate.

**Objective**
1. Sample transportation beyond in-plane fluidic network system.
2. Addressing of fluidic gate arrays.
3. A simple fabrication method and a disposable micro device.

**Concept of Our Research**
- Collect targeted samples from a testing well plate.
- Row/column addressing.
- Memory function for the gate valve.

**Scope of this work**
1. Layer to layer sample transportation
2. Collect targeted samples from a testing well plate
3. Row/column addressing
4. Pneumatic controlled fluidic gates
5. Irreversible / multi-layer bonding process
6. Transparent, disposable material

**3 × 3 Fluidic Gate Arrays**

**Schematic view and fabricated device**
- **Matrix address**
  - (a) Schematic view of 3 × 3 fluidic gate arrays.
  - (b) Fabricated device.
- **Structures of the device**
  - (c) A single fluidic gate.
  - (d) A-T cross-sectional view.

**In Situ Programmable System**

**Experimental results**
- (a) Initial state.
- (b) Addressed @ (3,3).
- (c) Addressed @ (2,2).

**Demonstration of in situ programmable system**
- (d) In situ programmable system.
- (e) Layer-to-layer fluidic transportation system.
- (f) Result of demonstration.

**Memory Function of Fluidic Transportation System**

**Pre-programmable system**

**Bi-stable motion of buckled diaphragm**

**Summary**
We presented addressable fluidic gate arrays for layer to layer parallel fluidic transportation system. Selective layer to layer parallel fluidic transportation system was successfully demonstrated. Samples in the upper well plate having 3 × 3 wells were dispensed into different lower well plates by controlling the state of valves, open / close. Memory function for the gate valve was proposed for pre-programmable system. The proposed strategy can be expected to improve fluidic manipulation system for biochemical and pharmacological screening.