# Yoshida Lab.

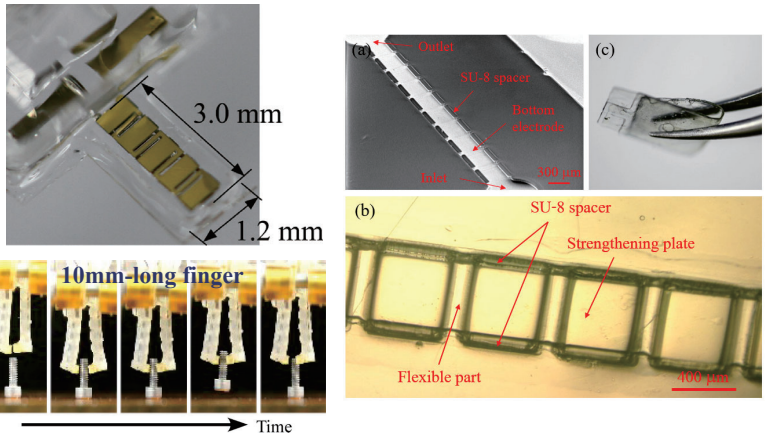
## Innovative MEMS/Micro Systems Using Smart Materials

Innovative Mechano-Device Research Core, FIRST

http://yoshida-www.pi.titech.ac.jp/

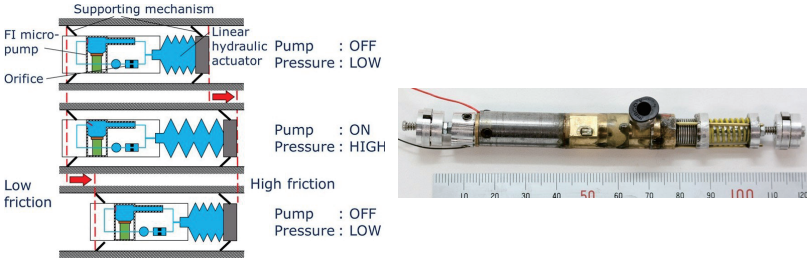
- New microactuators using functional fluids
- High-output power micro fluid power sources
- Advanced microrobots using fluid power

For advanced microrobots that perform power-needed tasks in micro areas, we have been developing innovative MEMS/ micro systems using smart materials such as an ERF (electro-rheological fluid) that changes its viscosity by an applied electric field. Microactuators, microvalves, micro fluid power sources, and micro-robots have been developed by using MEMS technologies.



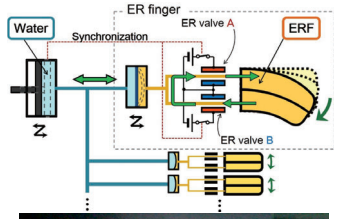

### Flexible ER micovalve

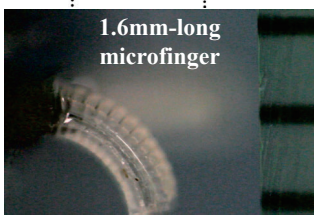
- Divided electrode or conductive polymer was used.
- The microvalves were realized by MEMS technologies.

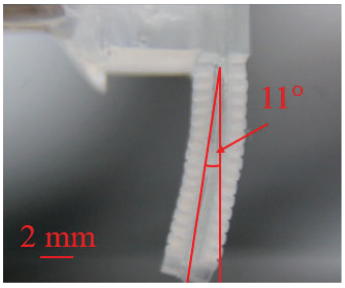



### In-pipe mobile microrobot using FI micropump

- The robot travels with on/off controlled FI micropump
- Traveling velocity of 0.9 mm/s was realized.

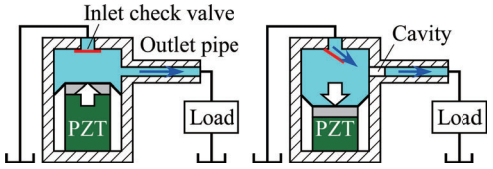


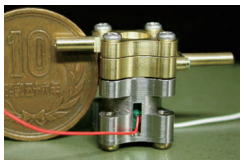




### Multiple ER microfinger system using alternating pressure source

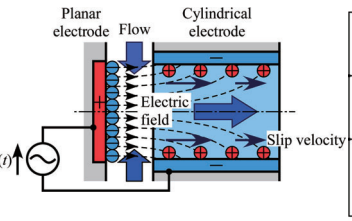
- Each microfinger is driven by synchronously rectifying ERF alternating flow using ER microvalves.
- 1.6 mm log microfinger was realized.
- Microfingers using FERVs were realized.

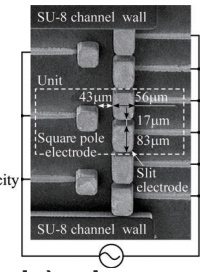


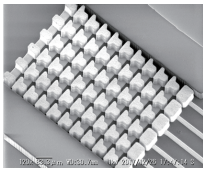



### FI micropump

- Flow rate was increased by using fluid inertia (FI).
- Output power of 1.6 W was realized with 1.3cm$^3$-sized micropump.



### ACEO (ac electroosmosis) micropump

- ACEO is generated by square pole and slit electrodes.
- Flow velocity of 1.6 mm/s was realized with 0.2×0.2×0.05mm$^3$-sized micropump.