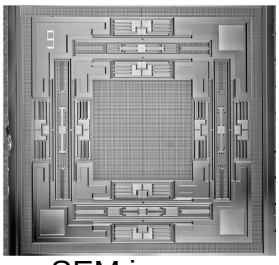
Department of Robotics

Tanaka (S) ・ Yamada ・ Vergara / Tsukamoto Lab.

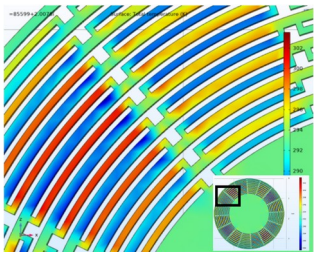
MEMS (Micro Electro Mechanical Systems) is a micro machine made by semiconductor microfabrication process. A lot of MEMS devices such as microphone, motion sensor, pressure sensor, RF filter and oscillator are already used in many applications : Smart phone, digital camera, drone, car etc. Our research area is wide, from fabrication technology, design, control system, to evaluation. Our lab is one of the most active MEMS lab in the world.

Next generation gyroscope

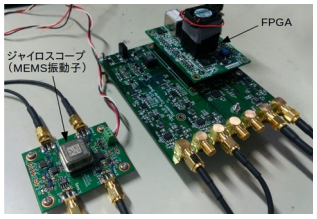
Gyroscopes are important for autonomous driving, attitude control of drones, etc. We focus on next generation high performance MEMS gyroscopes, from resonator to contol systems.

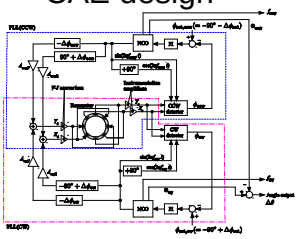


SEM image



CAE design

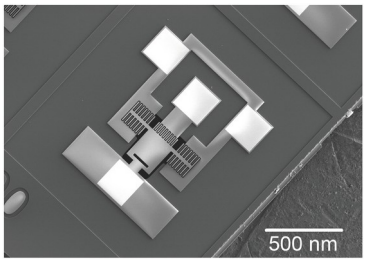




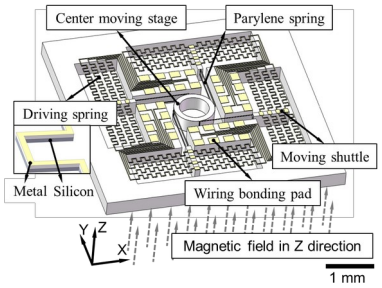
Development of next-gen. control system

Functional Resonator/Actuator

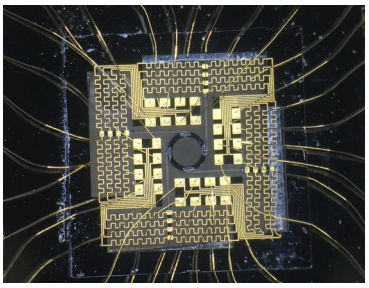
Temperature compensated resonators are of interest in the field of sensors and timing devices. We have developed one, optimizing dopant density and its structure. We also developed a magnetic actuator with large deformation, deploying polymer springs and tiny magnets.



SEM image of resonator



Schematic of actuator

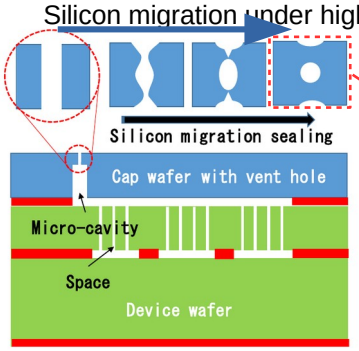


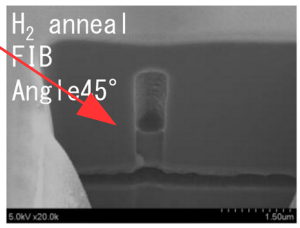
Optical image of actuator

High reliable packaging

We developed technologies to create fabrication technologies for next generation MEMS packaging. Extremely clean and high vacuum cavity can be created in a silicon device, which enables the MEMS device much more reliable and high performance.

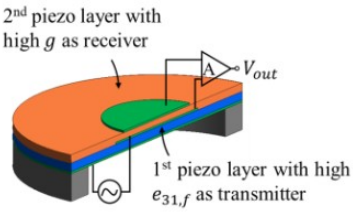
Silicon migration under high temperature



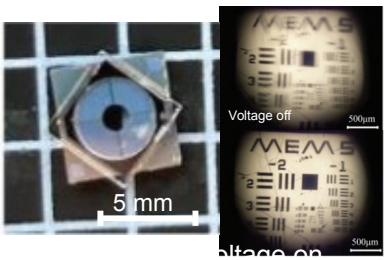


Piezoelectric MEMS

Using piezoelectric materials can realize low power consumption, high force and fast response devices. We develop better piezoelectric thin films and new devices.



Novel integration of two piezo layers for ultrasonic transducer



Piezoelectric varifocal liquid lens with built-in position sensors

In addition to the above examples, we are developing sensor systems, ultrasonic sensors, microphones, soeakers, RF-filters, etc. as well as functional materials and manufacturing techniques.

More in detail,

Visit us

Micro Electro Mechanical Systems Lab
Tanaka Shuji Laboratory