

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Integrated MEMS Technology for Multi-functional Low Power Electronics

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1. Background of research

Integrated MEMS or microelectromechanical system is a More-than-Moore type high-value-adding technology to integrate micron-scale mechanical actuators, sensors, and electronics onto a tiny chip of silicon substrate by utilizing the semiconductor micro fabrication processes, and it is expected to deliver international competitive strength to the nation's industry for the next generation electronics and energy saving technologies. Nonetheless, the conventional MEMS development activities have been performed application-wise without accomplishing systematic approaches based on the standard design and fabrication techniques.

2. Research objectives

We set a MEMS target on low-power electronics and develop the following items: (1) standard multi-physics analysis and simulation technique to handle both micro mechanical components and electronics, (2) standard wafer-level microfabrication process for integrated MEMS. (3) We also deliver application devices of integrated MEMS such as micro power-gating switch for LSI, ultra-small fiber optic medical endoscope, and tunable MEMS device for reconfigurable wireless electronics.

3. Research characteristics (incl. originality and creativity)

In the conventional design and fabrication environment for MEMS, it has been difficult to foresee the behavior of the overall integrated MEM system due to the missing link between microelectronics and micromechanics in every level of material development, total fabrication processes, signal interface and multi-physics simulation. To overcome this drawback, we straighten the standard design and process technologies that would be useful for microelectronics designers.

4. Anticipated effects and future applications of research

On the extension of this project, contribution should be delivered to the green-innovative technologies including the environmental sensing network by MEMS chips and low-power electronics by MEMS power-gating switches. Sideline contribution to life-innovative technology is expected such as ultra-small medical endoscope, autonomous drug delivery capsule, and distributed insect repellent system with MEMS atomizers.