

R&D of Multi-sensory Bio-composite Materials Utilizing the Structures and Functions of Living Organisms

<Program for Fostering Regional Innovation (Global Type) >

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Research Background and Its Purpose

<Background>

In these days, biosensors are being developed rapidly, and they are beginning to be applied to biological controls, environment measurement, and other related areas. However, the conventional technology has difficulties in order to perform real-time multi-signal responses and recognition of spatial information. Therefore, novel technologies overcoming such difficulties are required.

<Purpose>

In this research and development, we are proposing a novel concept "bio-processing unit (BPU)" by making use of orchestrated sensing and signal processing capabilities of living cells from various organisms (cellular composites) packed in a system powered by organic and inorganic chemistry, microbial engineering, genetic engineering, optics and electric physiology. One of key features of BPU is "utilization of the structure and functions of living organisms as it is" through chemical (both organic and inorganic) and genetic modifications.

Bio-processing unit (BPU)

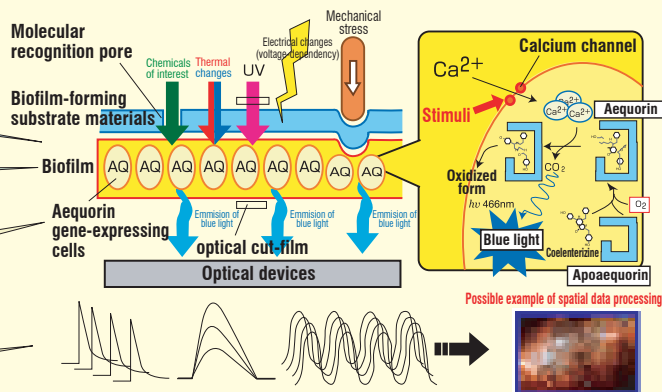
● Concept of BPU

Functional filter

Biofilm on which various microbes (cells) coexist

A technology based on genetic modification to visualize the intracellular signaling events caused by the external (environment) stimuli

Processing of the signals from the cells



Analysis of wave characteristics -> Identification of specific ion channels responding to each stimulus
Analysis of signal intensity -> Quantification of the stimuli (thermal changes, humidity, mechanical pressure, electric potential, chemical concentrations)

● Characteristics of BPU

- Multiple signal responsiveness (Multiple signal, concerted process)
- Real time responsiveness
- Controllable sensitivity and selectivity
- Array configuration of cells -> Two-dimensional and spatial imaging capabilities
- Self-organizing and growing capability
- Friendly to biological systems
- Low environmental load
- Small space requirement even though it is multilayered

Through this R & D, novel sensing materials made of the arrays of growing and self organizing living cells, showing a spatial recognition capacity with low environmental load will be developed. Then, high-performance bio-processing products capable of articulate responses to specific stimuli will be materialized.



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