

# Shonan and Central Kanagawa Area

Application of Photo-functional Materials to Improvement of Suburban Environment

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## Project Promotion

Project Director... Akira Ishitani (Executive Director,  
Kanagawa Academy of Science and Technology)  
Science and Technology Coordinator... Kazuhiko Tamaki

## Major Participating Research Organizations

Industry...SEIWA Industrial co.,Ltd., UBE-NITTO KASEI CO., LTD  
KANTO CHEMICAL CO., INC., RIKEN KEIKI Co., Ltd  
Academia...The University of Tokyo, Keio University  
Tokyo University of Marine Science and Technology, Kanagawa University  
Kanagawa Institute of Technology, Tokai University  
Shonan Institute of Technology, Nihon University  
Tokyo Polytechnic University, Aoyama Gakuin University  
Yokohama National University  
Government...Kanagawa Agricultural Technology Center  
Kanagawa Prefectural Institute of Public Health  
Kanagawa Prefectural Fisheries Research Institute  
Kanagawa Industrial Technology Research Institute, RIKEN  
Kanagawa Academy of Science and Technology

## Core Research Organizations

Kanagawa Agricultural Technology Center,  
Kanagawa Prefectural Institute of Public Health,  
Kanagawa Academy of Science and Technology

## Aim of research and development

This project is to foster and utilize intelligent resources in the region such as accumulation of the promising research results and networks related to photo-functional materials as part of the Kanagawa "Collaboration of Regional Entities for the Advancement of Technological Excellence (CREATE)" project of JST.

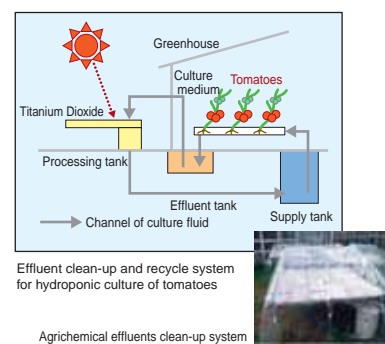
The project has focused on the "Application of Photo-functional Materials to Improvement of Suburban Environment" in "Shonan and Kanagawa Central Area". In particular, it has focused on the environmental needs of the Shonan and Kanagawa Central area as the eco-coexistence model area, the incubations of technologies in the area aiming at achievement of conservation of a comfortable urban life and eco-friendly agriculture to cope with the environment in harmony as Growing Stage Program (2 topics) and research and exchange programs including feasibility studies.

Thus, Shonan and Kanagawa Central Area are aiming to be an intelligent base of the environmental technologies for preservation of environment and creation of new business.

## Contents of research

### 1. Clean-up System of Agricultural Effluent Using Photo-catalyst and Solar Energy

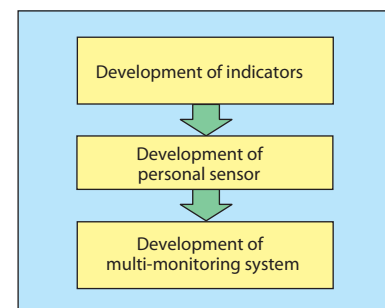
The new technology to reduce the burden on the environment was developed using Titanium Dioxide photo-catalyst and solar energy for agriculture in suburban areas. Specifically, 1. Light weight, low cost and user friendly photo-catalyst carriers with high efficiency applicable to the farming site, 2. Completely closed hydroponic culture system to reuse and recycle the effluent of culture solution from the culture system in the greenhouse and 3. Low cost and simplified system to make chemicals harmless to the disposable level to farm, sewer or river, through the use of photo-catalyst and solar energy to decompose pesticides in water such as effluent from seeds disinfecting as well as cleaning of pesticide containers, have been studied.



Effluent clean-up and recycle system for hydroponic culture of tomatoes  
Agricultural effluents clean-up system

### 2. Development of simple measurement method of hazardous chemicals such as Sick-house Syndrome Related Compounds using Photo-functional materials.

Various indicator reagents were designed, which helps to identify sick-house syndrome related materials such as toluene, xylene and acetaldehyde, environment contamination materials including nitrogen oxides in air and phosphoric compounds in water, heavy metal ions and pollens or house dust in a easy, fast and accurate manner. Next, the personal sensor using these agents was developed as well as the multi-monitoring system to detect multiple chemical materials simultaneously. In addition, the performance evaluation was conducted aiming at commercialization of the new agents and sensors through the field studies including evaluation and comparison with official methods, safety evaluation of carcinogenic and toxic materials and the official analysis methods.



Flow of development targets

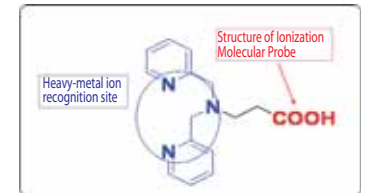
Development of new technology to reduce environmental loading by photocatalytic process

## The main study results

- Highly effective and Low Cost Matt Type Photo-catalyst Carrier**  
As a key technology for a wide range of practical use of agricultural fields, an inexpensive, high efficiency, lightweight and easy-to-handling photo-catalyst carrier has been studied. As a result, the photo-catalyst carrier of bonded textile materials was developed, which is available for a cost about one tenth of that of ceramics.
- Molecular Ionization Reagents for Mass Spectroscopy of Heavy Metals**  
The mass spectroscopy ionization reagent KHM-01 was developed, which enables safe, highly sensitive, highly selective, and easy identification and quantitative determination of multiple heavy metal ions.
- Fluorescence Indicator for Toluene**  
The compounds named as KD-TX02, the indicating reagent for toluene, has been developed, which emits a clear and strong fluorescence light (green) when irradiated with UV after contacting with toluene.



Photocatalytic mats with various characteristics



Formula of heavy-metal ion analysis reagent(KHM-01)



Condition when applying ultraviolet before and after spraying toluene gas to KD-TX02

