R&D of High-performance Nanotech Inorganic Materials and LSI Application

<Program for Fostering Regional Innovation (Global Type) >

Project Team

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Enterprises

FUJICO CO.,LTD.
Catalysts & Chemicals Industries Co., Ltd.

Purpose of the Research

1) We will establish a technology to produce a high-performance and hypersensitive photocatalytic filter unit for environmental purification.

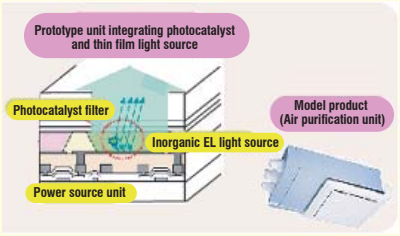
Our goal is to realize a clean and safe global environment and living space by constructing a system to maintain and purify the global environment and living space for houses and vehicles without placing a burden on the environment.

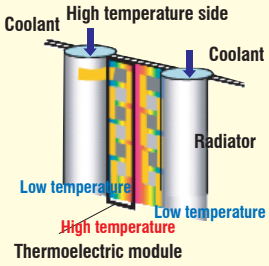
2) We will develop a thermoelectric module with ultrahigh efficiency by using nanostructured thermoelectric materials with artificially reduced thermal conductivities.In this project we intend to use waste of heat for power generation.

Summary of the Research

1) We will develop a hypersensitive photocatalyst that is active even under the very weak visible light in a house or a vehicle and a high-luminance thin film light source (Inorganic EL) which is optimum for the wavelength absorbed by that photocatalyst.
Also, we will design and develop a high-performance and hypersensitive photocatalytic filter unit, which combines the developed photocatalytic and the thin film light source, for the use in vehicles and houses.
The surface of the various metal materials upon which a film of the hypersensitive photocatalytic nano particles is formed has a potential to be used as a next-generation functional material for automobiles and robots since it has a superhydrophilic and anticorrosive characteristic.

2) We will make both p-type and n-type thermoelectric oxides, and incorporate nanostructures into the materials for enhancement of the thermoelectric properties. we will assemble them into the π-type thermoelectric module as a waste heat recovery system. The system can be used in an incinerator, vehicles, robots and so on.



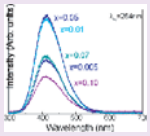


Results of the Research

Light emitting materials

$Sr_2(Sn_{1-x}Ti_x)O_4$

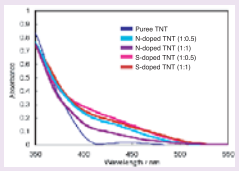
x= 0.005 0.01 0.05 0.07 0.10



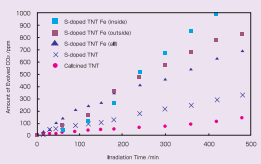
Succeeded in developing a ultraviolet and blue fluorescent material which emits a wavelength that is efficiently absorbed by the photocatalysis

Photocatalyst

S-doped TNT (titania nanotube)



Absorption spectrum

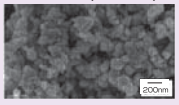


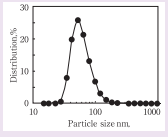
- Light source : 500W Xe lamp
- Wavelength : λ >350 nm
- Light intensity : 10 mW / cm²
- Initial concentration of acetaldehyde : 500 ppm

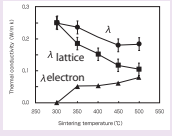
Succeeded in developing a high-performance visible light response photocatalyst by controlling the structure in nano scale

Thermoelectric oxides

Nanoparticles of thermoelectric semiconductor ($Bi_{0.4}Te_3Sb_{1.6}$)







Thermal conductivity of a nanoporous $BiFTe^3$

(Thermal conductivity of the bulk $Bi_{0.4}Te_3Sb_{1.6}$: 1.5 W/(m-K))

Prospective Fields of Application

Onboard air purification unit

Indoor purification system

Power generation with automobile waste heat

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