●Basic Stage

(Fiscal Year 2003-2005)

# Wakayama City Area

Development of Organic Materials for Next-generation Electronic-Devices

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Life Sciences
IT
Environment
Nanotech Materials
Others

## Project Promotion

Chief Scientist… ……Shizuo Kubota
Science and Technology Coordinator…Hidekazu Matsumoto
Katsuta Nakagawa

## Core Research Organization

Industrial Technology Center of Wakayama Prefecture

## Major Participating Research Organizations

Industry…Sanbo Chemical Ind.Co.,Ltd., Shin-nakamura Chemical Co., Ltd.,
Sugai Chemical Industry Co., Ltd., Daiwakasei Industry Co., Ltd.,
Honsyu Chemical Industry Co., Ltd., Wakayama Seika Kogyo Co., Ltd.,
Keiwa Inc.
Academia…Wakayama University, Tokyo Institute of Technology,
Osaka University, Osaka Prefecture University, Osaka City University,
Wakayama National College of Technology
Government…Industrial Technology Center of Wakayama Prefecture,
National Institute of Advanced Industrial Science and Technology

## Aim of research and development

Many organic materials for electronic-devices of the next generation by use of the nanotechnology are developed using technology "seeds" accumulated by the Industrial Technology Center of Wakayama Prefecture, the advanced organic syntheses technology of organic chemical industries in Wakayama-city which have a long history since 1914 (Taisho Era in Japan), and the technology possessed in several universities, in which Wakayama University is included, joining in this project.
The advanced functionalization and the sensitivity for the electronic materials are demanded by high capabilities of the electronic materials in recent years.
We aim at the creation of new industries that are superior to the traditional industries for organic materials, and establish the bases of cooperation between industries, universities, and the local government of Wakayama Prefecture.

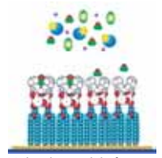
**＊Organic nanotechnology materials**

Organic nanotechnology materials are organic compounds and polymers made by use of the nano-scale (1 nano= 1 part per billion) and have the characteristics of regulatory technique for molecules and fine processing technology for solid. There are, for example, thin film sensors made with inclusion compounds, organic EL (electro luminescence), and resist materials which are used for photolithography.

## Contents of research

1. Development of creation technology of vital functional film by imitation using the orientation of molecules

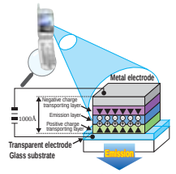
Aiming development of sensors which could detect high-sensitively and quickly the desired materials and contamination in the fields of medical treatment and environments, we made functional films that could recognize high-sensitively particular materials to attempt applications to sensor devices.



Molecular model of gas sensor with molecular recognition compound

2. Development of materials for novel organic electroluminescence

We selected organic EL materials that were paid attention to display materials for the next generation as the theme. As the results, we developed hetero-tricyclic aromatic rings, emission celluloses in which the fluorescent materials or the phosphorescent ones were introduced as the coloring matter, a conducting polymer film to transport hole, flexible base materials, etc.




EL device model

3. Development of new organic materials for electronics

We developed new excellent heat-stable or insulating electronic materials and high-quality resist materials improved line-edge roughness in the field of electronic materials that were asked for more high-functional and high quality by the progress of technology.

Microfabrication of resist

## The main study results

1. Development of gas-sensor using the orientation of molecules

We succeeded in the high detection of halogenated aromatic compounds and alcohols which were representative VOC's (Volatile Organic Compounds) using QCM sensor made with films obtained from calixarene derivatives which were molecular recognition compounds.

Gas sensor with molecular recognition compound

2. Development of high brightness luminescent materials

We obtained organic EL materials that were made with blue emission ones using tri-heterocyclic aromatic rings. They showed brightness of about 20,000cd/m$^2$ and emission efficiency of 4.5cd/A.

Created sample of EL device

3. Development of new monomers having alicyclic structure and new resist materials having many branch structures

- Imide resins made from alicyclic amide compounds had the high mechanical strength, high heat stable quality, and low dielectric quality. We applied for patents for insulators. One of the participation companies provided the sample to some users.
- We developed new resist materials (negative type and positive one) which had many branch structures and did not put out out-gas, and applied for patents for resist materials.