

# Mie/Ise Bay Shore Area

Development of New Functional Material for Next-Generation Display and its Application to Devices

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## Project Promotion

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## Major Participating Research Organizations

Industry... NORITAKE ITRON CORP., CHUBU CHELEST Co., Ltd., Piatec Co., Ltd., MIE ELECTRONICS CO., LTD., ASAHI PLATING CO., Ltd., Chubu Medical Co., Ltd., Mitsubishi Chemical Group Science and Technology Research Center, Inc., SHARP CORPORATION, Technex Lab Co., Ltd., Kureha Elastomer Co., Ltd., Hamamatsu Photonics K.K.  
Academia... Mie University, Nagoya University  
Government... Mie Prefectural Science and Technology Promotion Center

## Core Research Organization

Mie University

## Aim of research and development

The accumulation of the display industry is advanced in Mie/Ise bay shore area for production of the liquid crystal display under the approach for achievement of Crystal Valley Project of Mie Prefecture. Then, it specializes in the display related field, and technological seeds of a luminescent material using the nitride semiconductor of Mie University, a carbon nano tube, Lithium secondary battery material, and fuel cell (SOFC) material, etc. are noted in this project. This project works on industry-academia-government joint research, and aims at the research and development of the element devices, such as power supply, electronic excitation and luminescence device. That is, "Excitation device (electron emitter)" to emit the electron from the carbon nano tube is developed, and it ties to "X-ray device" and "Visible light emission device". Moreover, "Power supply device (all solid secondary battery)" that drives these devices is developed.

## Contents of research

### 1. Development of visible light emission material and element devices

The nitride semiconductor system high brightness luminescent material that has a nano photonic effect of Nano surpassing a conventional metal oxide system luminescent material is developed. It is used for FED-VFD. The organic and the inorganic luminescent hybrid material in which a red, green, blue conjugated light emitting polymer are dispersed in SiO<sub>2</sub> are developed by the sol-gel process. These hybrid materials are excited by UV or blue light and emits white light. Also a high brightness, flat and white light emitting device is development.

### 2. Development of cold cathode type small X-ray source device

A carbon nanotube (CNT) that is appropriate for long life and the high power electron emitter is developed. The electromagnetic lens system that focuses the electron beam emitted from CNT emitter is developed. Then, nano-focus small X-ray source device is developed. This device is applied to non-destructive inspection or medical equipment.

### 3. Development of all solid secondary battery and fuel cell

The polymer solvent free electrolyte is synthesized by control of molecular structure of polyethylene oxide in order to make the battery solid. Safety, lightness, and the sheet-like all solid secondary battery which is used as driving power supply of the excitation device and the light emitting devices are developed by using these materials. On the other hand, the small SOFC (solid-oxide fuel cell) for low temperature operation is developed.

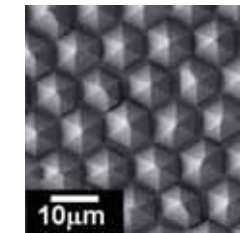
## The main study results

### 1. Development of visible light emission material and element device

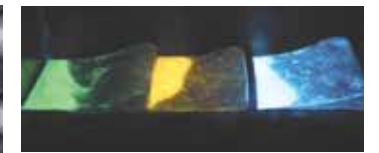
GaN system luminescence crystal thin film is made by the MOVPE method. It is mounted on VFD (vacuum fluorescent display), and the emission characteristic is evaluated.

Precursor synthesis of particulate GaN system luminescent material is synthesized.

Molecular design, the synthesis of RGB conjugated light emitting polymer, and establishment of hybridization technology by sol-gel process.



InGaN light-emitting thin film



RGB light-emitting hybrid particles

### 2. Development of small X ray source of cold cathode type

Growth control of CNT by thermochemistry (CVD) method.

Making CNT electron emitter for X-ray emission and evaluation of electron field emission characteristic.

Design and production of novel compact electro-magnetic lens system that focuses the electron beam.

A preliminary X-ray generator is produced, and it takes a picture of a fine image.

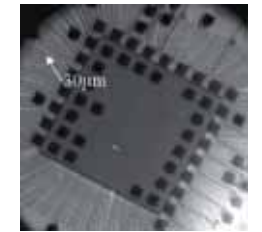


Image of X-ray transmission (sample: bonding wire)

### 3. Development of all solid secondary battery and fuel cell

The novel cathode material, three dimensional Fe compounds and anode material, metal carbon hybrid compounds are synthesized.

The novel polymer electrolyte hyper branched cross-linked PEO is synthesized. Its ionic conductivity 10-3s/cm order.

All solid polymer secondary Lithium battery prototype is achieved.



Sheet type all solid state lithium secondary battery prototype

