

# FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

**Project Title:** Nanoscience of Switching Molecule for Ultimate Energy-Saving Device

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## 1. Background of research

By the advances of technologies in fabrication and manipulation of nano-scale structure, handling of organic molecule has become possible recently. By making the devices from organic molecule, electroconductive and photophysical properties of single molecule can be detected in molecular-scale nanoscience field.

## 2. Research objectives

In this research, we focus on the switching molecule which can change molecular structure by photoirradiation or charge injection and aim at the ultimate energy-saving device consisting of functional organic molecules. In other words, our goal is the realization of molecular-scale devices in which organic molecules function as diodes or transistors.

## 3. Research characteristics (incl. originality and creativity)

The characteristics of our research is to integrate the viewpoint of physical organic chemistry into nanoscience, to collaborate with applied physics and quantum physical chemistry, and to use our original molecule that is designed and synthesized by ourselves. We cover from synthesis to measurement so that the research can be implemented with high activity and high competence.

## 4. Anticipated effects and future applications of research

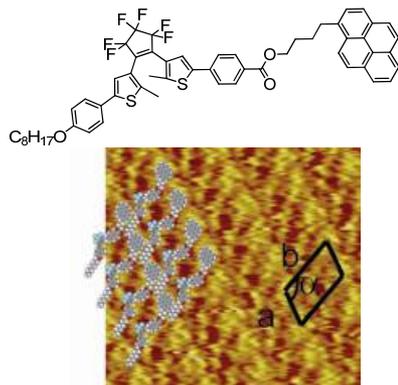
The switching molecule is considered as a promising candidate for molecular device. When information is stored in one single molecule and calculation is performed by one single reaction, the energy cost for data storage and data processing will be dramatically diminished.

# Outline of Research

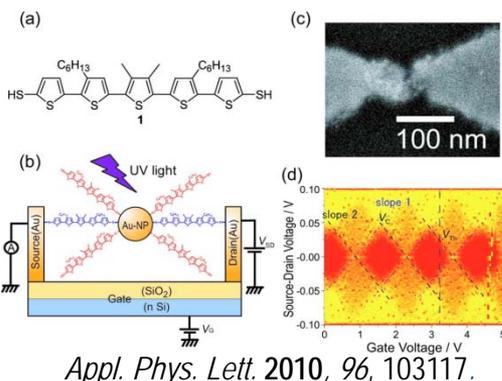
## Nanotechnology

### Advances in fabrication and manipulation of nano-scale structure

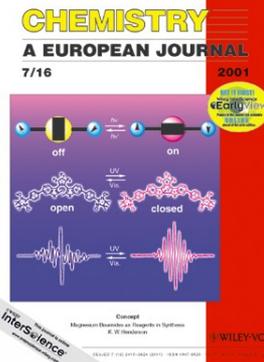
Physical properties of single molecule can be detected.



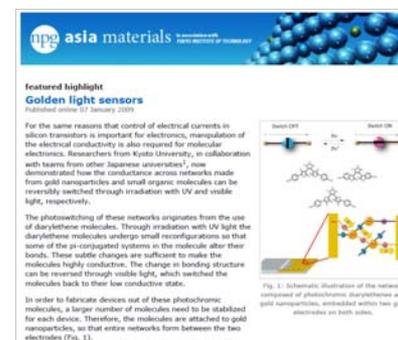
*J. Am. Chem. Soc.* 2008, 123, 9896.



*Appl. Phys. Lett.* 2010, 96, 103117.



*Chem. Eur. J.* 2001, 7, 3466.



Nature Publishing Group *Asia Materials* highlighted on the Web Jan 7 2009.

From the viewpoint of physical organic chemistry

Molecular-scale nanoscience

Molecular-scale electronics with switching molecule

Ultimate energy-saving device consisting of organic molecules functioning as diodes or transistors.

Molecular Computer