

IMMEDIATE RELEASE

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**Panasonic Develops Highly Efficient Artificial Photosynthesis System
Generating Organic Materials from Carbon Dioxide and Water**

Osaka, Japan - Panasonic has developed an artificial photosynthesis system which converts carbon dioxide (CO₂) to organic materials by illuminating with sunlight at a world's top efficiency*¹ of 0.2%. The efficiency is on a comparable level with real plants used for biomass energy. The key to the system is the application of a nitride semiconductor which makes the system simple and efficient. This development will be a foundation for the realization of a system for capturing and converting wasted carbon dioxide from incinerators, power plants or industrial activities.

Panasonic opens up a new way to reuse the wasted carbon dioxide to a usable energy source. This efficient system with a simple structure has been realized by applying a nitride semiconductor as a photo-electrode. The simple structure has a significant advantage in scalability for real systems.

CO₂ is one of the substances responsible for greenhouse effect and as such, efforts are being made to reduce the emissions of CO₂ worldwide. The problem of CO₂ is also directly connected to an issue of the depletion of fossil fuels. Artificial photosynthesis is the direct conversion from CO₂ into organic materials, which can solve both of these problems.

In the previous approaches so far, the systems have had complex structures such as organic complexes or plural photo-electrodes, which makes it difficult to improve their efficiency in response to the light. Panasonic's artificial photosynthesis system has a simple structure with highly efficient CO₂ conversion, which can utilize direct sunlight or focused light.

We found firstly that a nitride semiconductor has the capability to excite the electrons with enough high energy for the CO₂ reduction reaction. Nitride semiconductors have attracted attention for their potential applications in highly efficient optical and power devices for energy saving. However, its potential was revealed to extend beyond solid devices; more specifically, it can be used as a

photo-electrode for CO₂ reduction. Making a deviced structure through the thin film process for semiconductors, the performance as a photo-electrode has highly improved.

The CO₂ reduction takes place on a metal catalyst at the opposite side of nitride semiconductor photo-electrode.(See Fig. 1) The metal catalyst plays an important role in selecting and accelerating the reaction. Here, it is noted that the system comprises of only inorganic materials, which can reduce the CO₂ with low energy loss. Because of this, the amount of reaction products is exactly proportional to the light power. This is one of the merits in such an all-inorganic system while some conventional systems cannot follow the light power in general because of their internal or external rate-limiting processes in the complex structures.

The system with a nitride semiconductor and a metal catalyst generates mainly formic acid from CO₂ and water with light at a world's top efficiency of 0.2%. The efficiency is of a comparable level to real plants used in the biomass energy source. The formic acid is an important chemical in industry for dye and fragrances. The reaction rate is completely proportional to the light power due to the low energy loss with simple structure; in other words, the system can respond to focused light. This will make it possible to realize a simple and compact system for capturing and converting wasted carbon dioxide from incinerators and electric generation plants.

On this development, Panasonic holds 18 domestic patents and 11 overseas patents, including pending applications.

This development was partially presented at 19th International Conference on the Conversion and Storage of Solar Energy held on Pasadena, United States on July 30, 2012.

*1: As of July 30, 2012. The energy proportion of synthesized materials to input light.

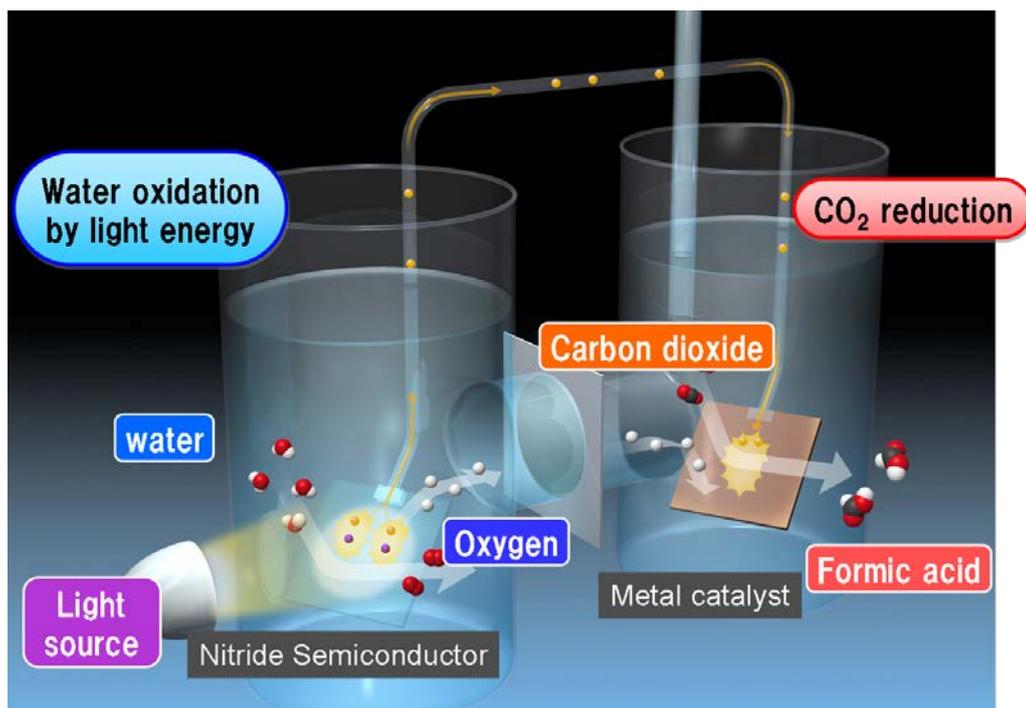


Fig.1 schematic view of artificial photosynthesis system

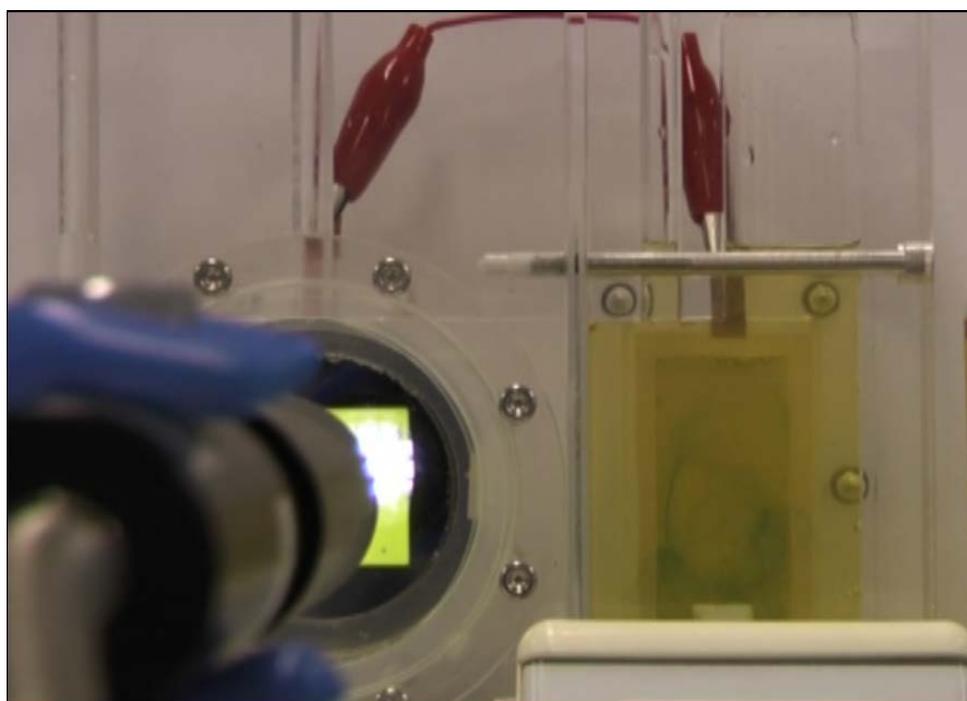


Fig.2 Experimental picture of artificial photosynthesis system
(Left: nitride semiconductor, Right: Metal catalyst)

The change of color from yellow to blue on the right represents that the system is actually reducing the carbon dioxide.

About Panasonic

Panasonic Corporation is a worldwide leader in the development and manufacture of electronic products in three business fields, consumer, components & devices, and solutions. Based in Osaka, Japan, the company recorded consolidated net sales of 7.85 trillion yen for the year ended March 31, 2012. Panasonic's stock is listed on the Tokyo, Osaka, Nagoya and New York (NYSE:PC) Stock Exchanges. The company has the vision of becoming the No. 1 Green Innovation Company in the Electronics Industry by the 100th year of its founding in 2018. For more information on Panasonic, its brand and commitment to sustainability, visit the company's website at <http://panasonic.net/>.

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