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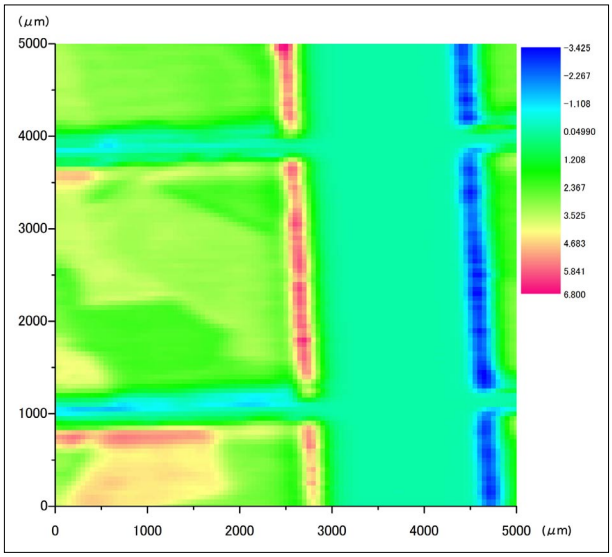
Dainippon Screen and Osaka University Achieve World-First Success In Visualization of Instantaneous Power Generation of Solar Cells

Toward Improved Conversion Efficiency of Solar Cells Based on Terahertz Waves Combining Characteristics of Both Light and Radio Waves

Kyoto, Japan – October 25, 2011 – Dainippon Screen Mfg. Co., Ltd. and Osaka University have for the first time in the world succeeded in detecting the terahertz waves* generated by exposing a laser beam onto a solar cell for an extremely short time. This involved visualization of the instantaneous electrical generation of a solar cell for just one trillionth of a second, something that could not previously be confirmed. Both plan to continue research on improvement of the conversion efficiency of solar cells.

Terahertz waves are electromagnetic waves with lengths on the boundary between so called light, such as X rays, visible light and so on, and radio waves used in devices such as radios and radar. They possess characteristics that penetrate physical materials easily and the interaction between them allows these materials to be analyzed. In contrast, there are many issues with terahertz wave generation and their detection methods and they have been called an unexplored area of electromagnetic waves. However, in recent years, development has been carried out due to progress in research and their applications are currently anticipated in various fields including airport security checks and non-destructive inspection.



Terahertz wave generated by solar cell

Please download the photo from
www.screen.co.jp/eng/press/nr-photo_2009-2011.html

Photovoltaic power generation has been attracting increasing attention as safe, renewable energy as well as a way to reduce global warming. However, in order to achieve widespread adoption of solar cells, from family use through to power plants, it has been necessary to solve issues such as large production costs and installation space for many years. As a result, the improvement of conversion efficiency has become a major theme in related industries. It is said that if the solar energy that constantly rains down on the Earth could be converted completely, the world's annual energy consumption could be met in as little as one hour. So, the improvement of the conversion efficiency of solar cells is an important key to resolving the energy problems of the future.

Recognizing this trend, Dainippon Screen and Osaka University have been continuing joint research on terahertz wave detection/analysis technologies for solar cells and have now for the first time in the world succeeded in visualization of the instantaneous electrical generation of a solar cell for just one trillionth of a second. This project utilized a laser terahertz emission microscope (LTEM)** developed by Osaka University and measuring/image processing technology cultivated by Screen over many years. By exposing laser light onto a solar cell for an extremely short time, it became possible to measure the terahertz wave generated from the solar cell without contacting the cell, allowing a detailed analysis of its internal power generation. This technology has great potential and could lead to the development and evaluation of solar cells with even better generation efficiency.

Screen and Osaka University also intend to continue the development of applications for terahertz wave detection/analysis technology based on their collaborative research. The goal is to establish a new manufacturing technology that will support the solar cell industry, which is widely regarded as an effective approach for solving energy problems. In addition, both plan to push forward technological development in the cutting-edge energy field and further contribute to the realization of a low-carbon society.

* Terahertz wave
Refers to a wave frequency in the terahertz range (1 tera equals 1 trillion). Electromagnetic waves have a length of 3 mm to 10 μm and a frequency from 100 GHz to 30 THz.

** Laser terahertz emission microscope (LTEM)
A terahertz wave application analysis system developed by Professor Tonouchi of the Institute of Laser Engineering, Osaka University.
An LTEM system exposes laser light onto a semiconductor for an extremely short time of around 100 femtoseconds and then visualizes the generated terahertz waves. (1 femtosecond equals one quadrillionth of a second)

Note: This technology will be announced on November 29 (Tuesday) at the first International Symposium on Terahertz Nanoscience (TeraNano 2011), which is being held at Osaka University's Nakanoshima Center from November 24 (Thursday), 2011. (www.ile.osaka-u.ac.jp/research/THP/TeraNano)