TOYOHASHI UNIVERSITY OF TECHNOLOGY
Master Technology, Create Technology

TOYOHASHI UNIVERSITY of TECHNOLOGY
e-Newsletter
News and views from one of Japan's most innovative and dynamic science and technology-based academic institutes

No.17, december 2014

Research highlights

High efficiency electrodeposited ZnO-Nanowire/Cu_2O photovoltaic devices

Masanobu Izaki

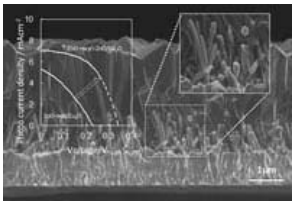

Fig.1: Integrated circuit with ZnO nanowires.

The wide bandgap energy and high optical absorption coefficient of oxide photovoltaic devices are attractive properties for next generation thin film device applications, especially as top cells in high performance multi-stacked solar cells.

However, the conversion efficiency oxide photovoltaic devices is low compared with theoretical estimates with the result that current commercial solar cells are produced using Si and $Cu(InGa)Se_2$.

Here, in an international collaboration between Toyohashi University of Technology (Toyohashi Tech) and Centre National de la Recherche Scitenfique (CNRS), Ecole Nationale Superiure de Chimie de Paris (ENSCP), ZnO nanowire (NWs) were used to expand the active layer in the Cu_2O light-absorbing layer and in the highly resistive i-ZnO layer to reduce the recombination loss at the heterointerface of ZnO/Cu_2O photovoltaic devices.

The ZnO-NWs was electrodeposited onto a transparent conductive glass substrate at CNRS, and then i-ZnO and Cu_2O layers were electrochemically stacked onto the ZnO-NWs at Toyohashi Tech for complete the fabrication of a photovoltaic device.

The introduction of the ZnO-NWs and the i-ZnO layer yielded an increase in the short circuit currenrt density and an improvement of the conversion efficiency of solar cells to 1.26 % which is higher than the 0.47 % reported today.

The results demonstrate show the importance of the heterointerface on the performance of oxide photovoltaic devices as solar cells.

Acknowledgements

This research was conducted with financial support from the Japan-France Integrated Action Program (SAKURA) of the Japan Society of Promotion of Science (JSPS).

Reference:

- Authors: Masanobu Izaki, Takayuki Ohta, Misaki Kondo, Toshiaki Takahashi, Fariza binti Mohamad, Mohd Zamzuri, Junji Sasanoi, Tsutomu Shinagawa, Thierry Pauporte
- Title of original paper: Electrodeposited ZnO-Nanowire/Cu_2O Photovoltaic Device with Highly Resistive ZnO Intermediate Layer.
- Journal, volume, pages and year: *American Chemical Society Applied Materials & Interface*, **6**, 13461-13469(2014).
- Digital Object Identifier (DOI): 10.1021/am502246j
- Affiliations: Department of Mechanical Engineering, Toyohashi University of Technology, and Ecole Nationale Superiure de Chimie de Paris.
- Department website: http://tf.me.tut.ac.jp