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**(Invited) Single-Walled Carbon Nanotubes and Graphene As Highly Efficient Hole Collecting and Transport Layer for Solar Cells**

Wednesday, 27 May 2015: 14:00

Lake Huron (Hilton Chicago)

S. Maruyama, K. Cui, T. Chiba, I. Jeon, X. Chen, R. Xiang, S. Chiashi, and Y. Matsuo (The University of Tokyo)

We investigate the application of single-walled carbon nanotubes (SWNTs) and graphene as hole extraction and transport layer in various kinds of solar cells including structured SWNTs-Si solar cell [1], dry-deposited SWNTs-Si solar cell [2], graphene-Si solar cells, organic solar cell [3] and perovskite solar cells. Using millimeter-scale monocrystalline single-layer graphene and honeycomb-structured SWNT network, the nanocarbon-Si solar cell demonstrated the air-stable power conversion efficiency (PCE) of 11.6% before any intentional doping process. For organic solar cells (OSC), the SWNT/MoOx/PEDOT:PSS nanocomposite was proposed and developed as hole extracting/electron blocking layer and electrode replacing ITO. Using PTB7/PC71BM mixture as active materials, the PCE of 6% was obtained for on glass substrate and 3.89% on flexible PET substrate. The hole collecting and transport function of SWNTs was also demonstrated in perovskite solar cells with high PCE. We expect that the carbon nanomaterials is very promising in the application solar cells.

References:

[1] K. Cui, T. Chiba, S. Omiya, T. Thurakitsee, P. Zhao, S. Fujii, H. Kataura, E. Einarsson, S. Chiashi, S. Maruyama, *J. Phys. Chem. Lett.*, **4** (2013), 2571.

[2] K. Cui, A. S. Anisimov, T. Chiba, S. Fujii, H. Kataura, A. G. Nasibulin, S. Chiashi, E. I. Kauppinen, S. Maruyama, *J. Mater. Chem. A*, **2**(2014) 11311.

[3] I. Jeon, K. Cui, T. Chiba, A. Anisimov, A. G. Nasibulin, E. I. Kauppinen, S. Maruyama, Y. Matsuo, to be submitted.

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