# Joint CQSE and CASTS Seminar

## Weekly Seminar
## Nov. 28, 2014 (Friday)

TIME Nov. 28, 14:30 ~ 15:30
TITLE Modified photoelectrodes for improving performance of dye-sensitised solar cells
SPEAKER Prof. Chun-Pei Cho
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PLACE Rm716, CCMS & New Physics Building, NTU

**Abstract**

Several phosphonic acids with various chain lengths and terminal groups were selected to form phosphonate self-assembled monolayers on the surfaces of TiO2 electrodes to explore how the open-circuit voltage (Voc), short-circuit photocurrent density (Jsc) and energy conversion efficiency (η) of dye-sensitized solar cells (DSSCs) were influenced by this surface modification approach. When an amine-carrying phosphonic acid with a negative dipole moment was used, the conduction band bottom (ECB) of TiO2 shifted closer to the vacuum level. This resulted in a larger Voc and higher DSSC performance. Furthermore, a higher TiO2 ECB would increase the gradient of Fermi energy level (EF), and a larger Jsc could be thereby achieved. It has been also demonstrated that Voc was certainly dipole-related, and device performance was dominated mainly by Voc but not correlated well with dark current. The differences in dark currents of the DSSCs with TiO2 electrodes modified by phosphonic acids were interpreted in terms of electronic properties of various terminal groups and electron tunneling barrier introduced by the phosphonate dipole layer. The results accomplished in our study revealed promising application of organic self-assembled monolayers to DSSCs.