Supplementary information for "A high-voltage dye-sensitized photocapacitor of three-electrode system"

Takurou N. Murakami, Norimichi Kawashima and Tsutomu Miyasaka*

Preparation of mesoporous TiO_2-coated photoelectrode (PE) and counterelectrode (CE)

Mesoporous TiO_2 film of PE was prepared on a F-doped tin oxide coated transparent conductive glass plates (FTO-glass; sheet resistance, 10 ohm/square) by coating a TiO_2 paste (Ti-Nanoxied D, Solaronix) and sintering at 550ºC for 30 min. The TiO_2 film was sensitized with Ru complex dye (N719)[11], cis-bis (isothiocyanato) bis (2, 2'-bipyridyl-4-carboxilicacid-4'-tetrabutylammonium carboxilate)ruthenium(II) (Ru 535-bisTBA, Solaronix) from 3 mM solution of acetonitrile, ethanol and *tert*-butyl alcohol (2:1:1). In preparation of CE, activated carbon powder (AC, Tomiyama Chemical; relative surface area, 1200 cm^2 g^{-1}) was dispersed in the N,N-dimethylformamide (DMF, Wako) in the presence of poly(vinylidene fluoride) (PVDF, Aldrich) as binding polymer with AC and PVDF contents of 4.8 g and 0.3 g per 1mL of DMF, respectively. The AC paste was applied to a Pt-spattered FTO-glass (Pt-glass) by the doctor blade coating and heated at 100ºC for 40 min for evaporation of DMF to give the AC-coated CE. Same procedure was applied to make the AC-coated IE, where a thin Pt plate (0.5 mm-thick) was used in the place of the Pt-glass.

Setups for light irradiation and charge-discharge measurements

For light irradiation to the photocapacitor, a 500W Xe arc lamp (Ushio Inc.) equipped with IR and UV cut-off filters was employed as the visible-light source, which illuminates the photocapacitor at incident intensity of 100 $mWcm^{-2}$. The charge-discharge characteristics were measured and recorded on a potentio-galvanostat of Toho Technical Research PS-08. Charging was conducted by continuous illumination of the photocapacitor in the short-circuit condition and discharge was subjected to constant-current galvanostatic discharge in the dark controlled by PS-08.