

electrolytic cell at room temperature in 0.25 M H_2SO_4 , HBF_4 , HClO_4 , HCl , and *p*-toluenesulfonic acid solution containing 0.25 M double-distilled aniline, respectively. After electrolysis, the electropolymerized-PANI CEs were quickly immersed in water, and then rinsed adequately with 200 ml ethanol and 200 ml two-distilled water for three times to remove residual acid and aniline monomer. Finally, the as-prepared electropolymerized-PANI CE dried at 90 °C overnight for use. The thickness of PANI film measured with a 2206 surface profile tester (China) was 5–20 μm , depending on electropolymerized charge capacity.

2.2. Fabrication of cell assembly

The TiO_2 (P25, Degussa, Germany) film was deposited on FTO by doctor blade technique, followed by sintering at 450 °C for 30 min. The thickness and active area of the TiO_2 film were about 10 μm and 0.15 cm^2 . The TiO_2 film was preheated at 120 °C for 30 min and then immersed into 3.0×10^{-4} M bis(tetrabutylammonium) cis-dithiocyanatobis-(2,2'-bipyridine-4'-COO) ruthenium(II) (N719, Solaronix) in anhydrous ethanol overnight. For the purpose of comparison, a Pt CE was also prepared by thermal decomposition at 400 °C. Sandwich cells were assembled by sealing the TiO_2 anode together with the electropolymerized-PANI or Pt electrode using

Surlyn (1472 Dupont) at 110 °C. The liquid redox electrolyte, consisting of 0.6 M 1-propyl-3-methylimidazolium iodide (PMII, Merck), 0.05 M I_2 , 0.1 M LiI and 0.5 M tertbutylpyridine in acetonitrile, was then introduced through a hole reserved in the surlyn polymer, which was sealed immediately with ultraviolet plastic (XSSS[®]) after irradiated by a sum of UV light. The active cell area was 0.15 cm^2 .

2.3. Measurement and characterization

Surface morphology of electropolymerized-PANI film was observed using a JSM-5600LV scanning electron microscopy (JEOL, Japan). The cyclic voltammetry (CV) of PANI electrodes was conducted in acetonitrile solution containing 10 mM LiI, 1 mM I_2 and 0.1 M LiClO_4 using a CHI 660A electrochemical workstation (CH instruments, USA). The auxiliary electrode and reference electrode were platinum wire and Ag/Ag^+ electrode. Charge-transfer resistance R_{CT} of CE was determined by electrochemical impedance spectra according to the previous report [19]. Photovoltaic performance of DSSC was determined using CHI 660A under the illumination of 500 W Xenon lamp (Beijing Changtuo technological CO., Ltd., China) equipped with infrared light filter at full sunlight of 100 mW cm^{-2} (1.5 AM).

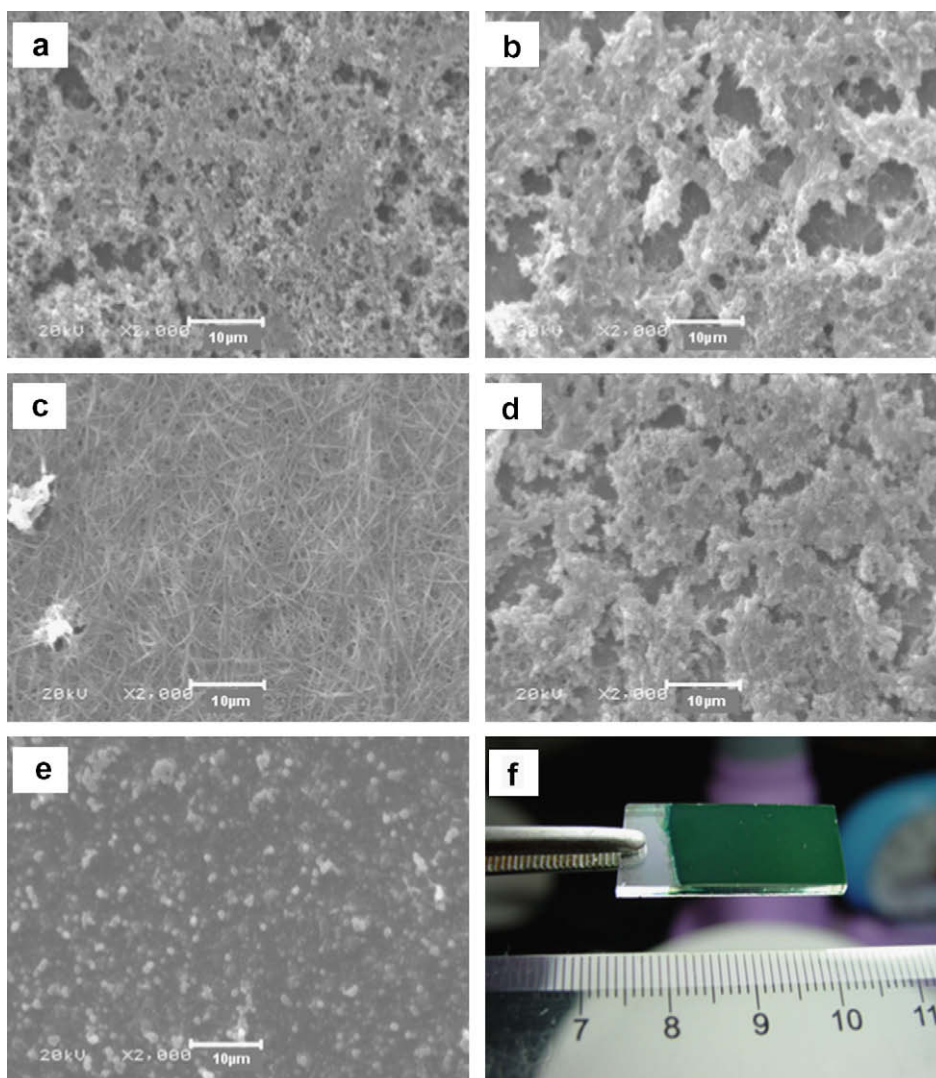


Fig. 1. SEM morphologies of (a) PANI- SO_4 , (b) PANI- ClO_4 , (c) PANI- BF_4 , (d) PANI- Cl , (e) PANI-TsO with electropolymerized charge capacity of 400 mC cm^{-2} , and (f) a picture of PANI- SO_4 film.

