Electronic supplementary information (ESI)

Heteroatom Tri-doped Porous Carbon Derived from Waste Biomass as Pt-free Counter Electrode in Dye-sensitized Solar Cell

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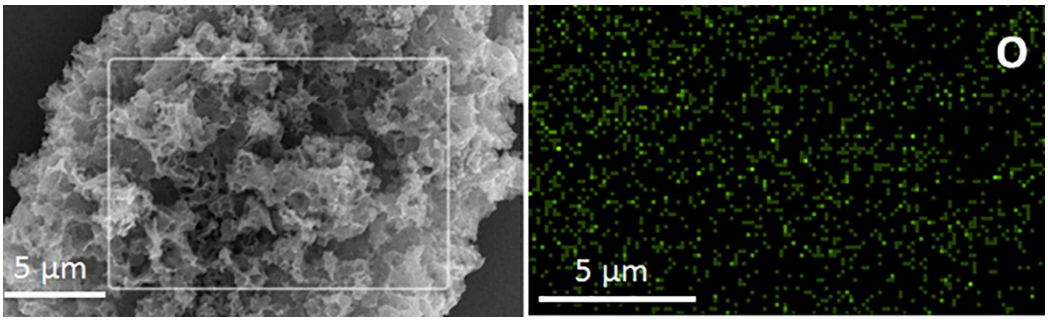


Figure S1. SEM image (a) and elemental mapping image (b) of O element for as-obtained porous carbon sample.

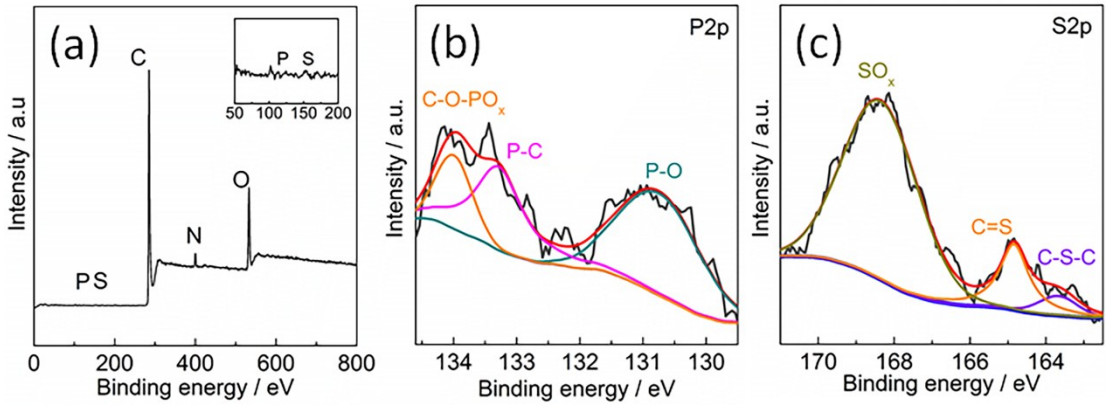


Figure S2. (a) The XPS survey spectra of as-obtained porous carbon sample with high resolution XPS spectra of (b) P 2p and (c) S2p element.

As shown in Figure S2b, there are four characteristic peaks in the P 2p spectra, located at 130.8, 133.2, 133.9and 136.0 eV. And these peaks are ascribed to formation of P-O, P-C, and C-O-PO_x. Figure S2c exhibits the S 2p spectra, associated with three peaks at 163.7 eV (C-S-C), 164.8 eV (C=S) and 168.4 eV (C-SO_x-C), respectively. It verified that the P and S elements were successfully doped into the porous carbon.

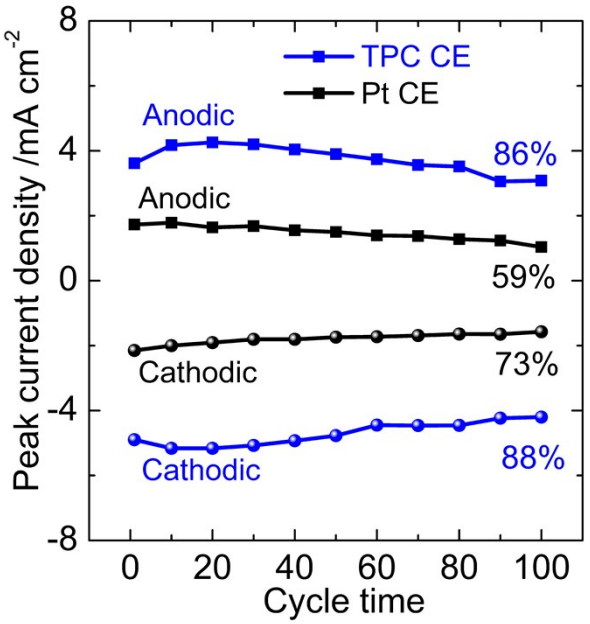
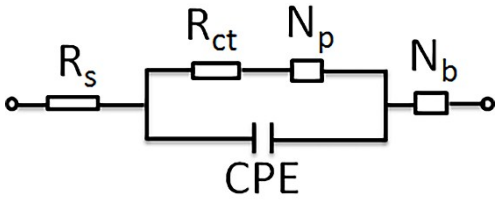
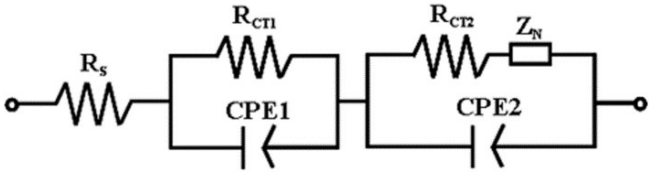


Figure S3. The changes in cathodic and anodic peak current densities of redox couple (I_3^-/I^-) on the TPC and Pt electrode in CV measurement during the 100 scanning cycles.



Scheme S1. The equivalent circuit for fitting experimental data in Figure 5b. R_s: Series resistance; R_{ct}: charge transfer resistance; CPE: double-layer capacitance; N_p: Nernst diffusion impedance within the electrode pores; N_b: bulk Nernst diffusion impedance in the electrolyte.



Scheme S2. The equivalent circuit for fitting data in Figure 6b. R_{ct1}: the charge-transfer resistance at the interface of the counter electrode and the liquid electrolyte; R_{ct2}: charge transfer resistance at the TiO_2/dye/electrolyte interfaces; Z_N: Nernst diffusion resistance of the redox couple within the electrolyte; CPE1 and CPE2: double-layer capacitances.