Supporting information for

Construction of surface electron island by simple organic molecule adsorption strategy: tuning the energy band structure and boosting photocatalytic performance

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Characterization

X-ray diffraction (XRD) was performed on a Bruker X-ray D8 Advance diffractometer with a Cu-Kα radiation in the 2θ range of 10-80°. Fourier transform infrared spectra (FT-IR) were recorded on a Bruker VERTEX 70 IR spectrometer using KBr pellets. The energy dispersive spectrometry (EDS) data, the morphology and sizes of the obtained photocatalysts were measured using a Hitachi S-4800 scanning electron microscopy (SEM) at 5 kV. The transmission electron microscopy (TEM) images, high-resolution TEM (HRTEM) images, mapping images and selected area electron diffraction (SAED) patterns of the as-synthesized materials were recorded on a JEOL JEM-2010F transmission electron microscope at 200 kV. The X-ray photoelectron spectroscopy (XPS) was measured on a ThermoFisher Scientific ESCALAB 250Xi photoelectron spectrometer. Ultraviloet-visible (UV-vis) absorption spectra of the as obtained photocatalysts were measured using a Hitachi U-3010 spectrophotometer during 250-800 nm at room temperature. The photoluminescence spectra (PL) were obtained on a Hitachi F-4500 fluorescence spectrophotometer (excitation wavelength: 250 nm).CHI 660E electrochemical instrument was used to performing the (Mott-Schottky curves, electrochemical impedance spectroscopy (EIS) and photocurrent density) with a three-electrode quartz cells (counter electrode: Pt wire; reference

electrode: Ag/AgCl; working electrode: photocatalysts coated ITO glass) and 300 W Xe lamp.

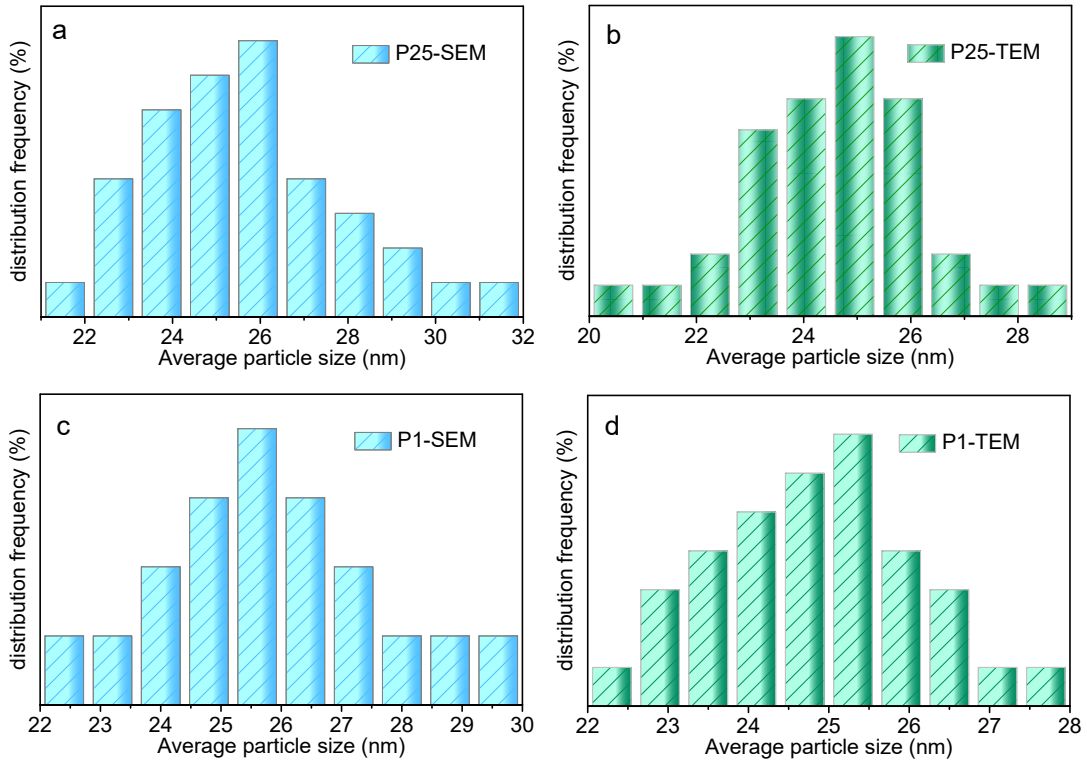

Fig. S1.The particle size distribution of P25 and P1

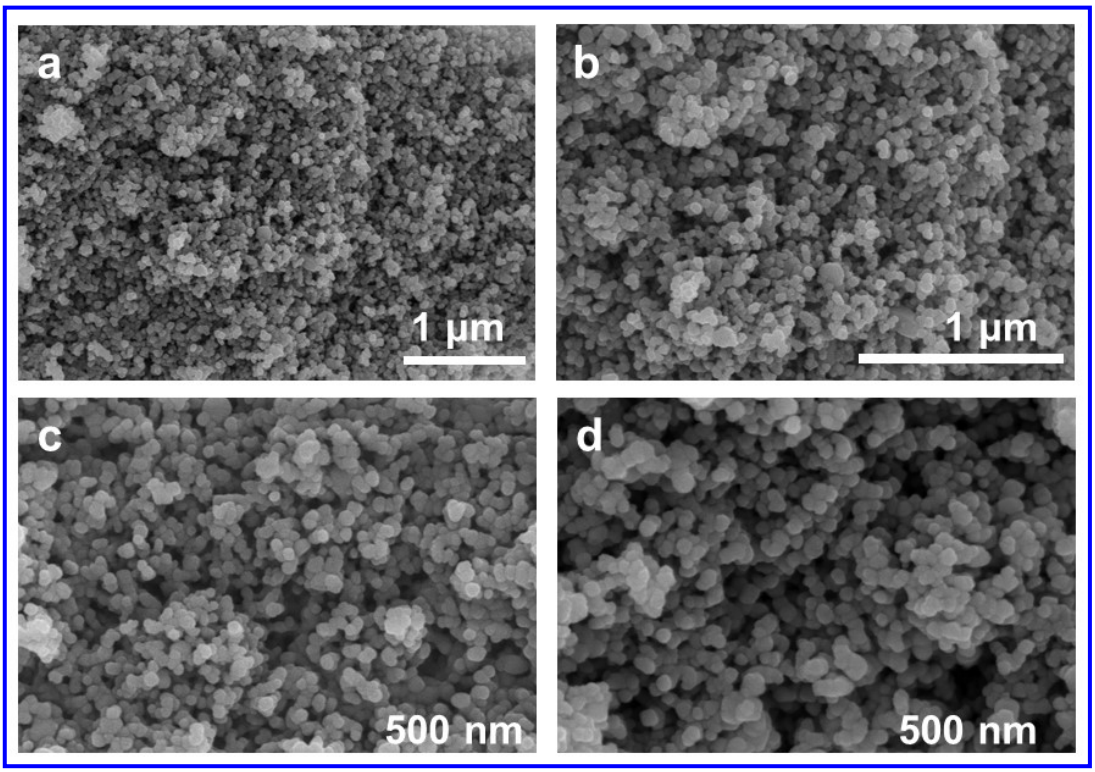

Fig. S2.The SEM images of P1 with different magnification.

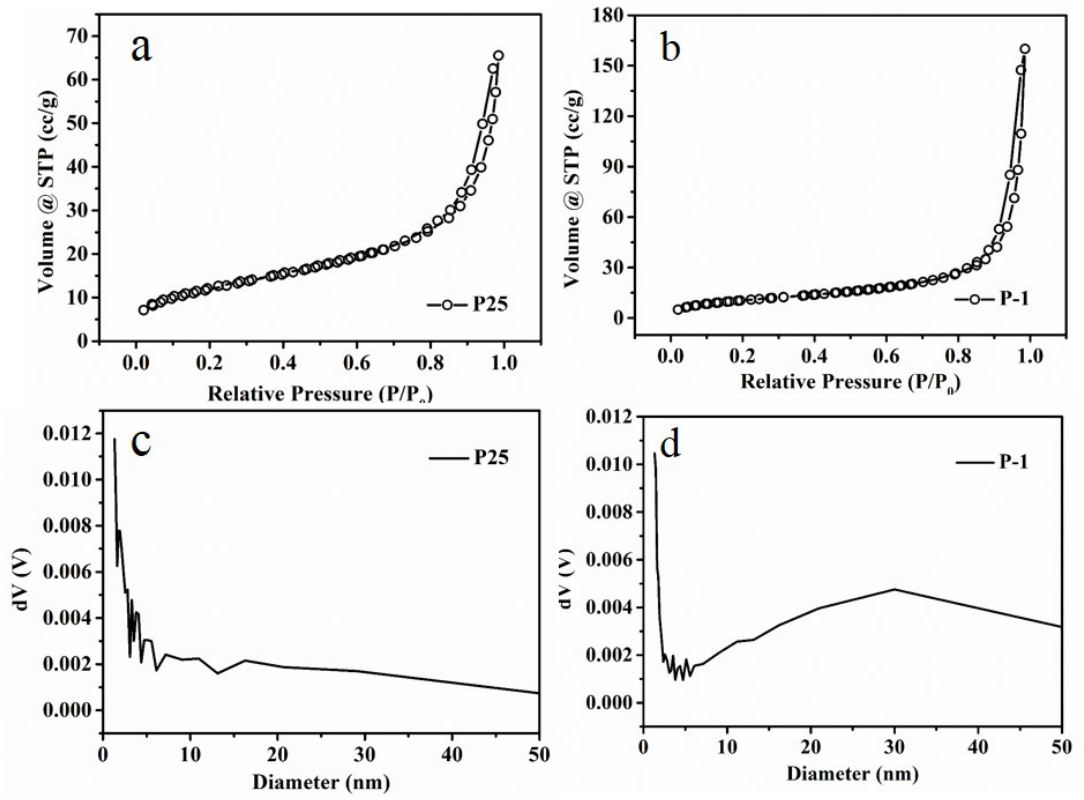

Fig.S3. the adsorption desorption curve and pore size distribution diagram of P25 and P-1

Table S1. The specific surface area and pore diameter of P25 and P-1

Sample	Surface Area (m^2/g)	Pore Volume (cc/g)	Pore Diameter (nm)
P25	50.220	0.103	1.321
P-1	51.524	0.252	1.327

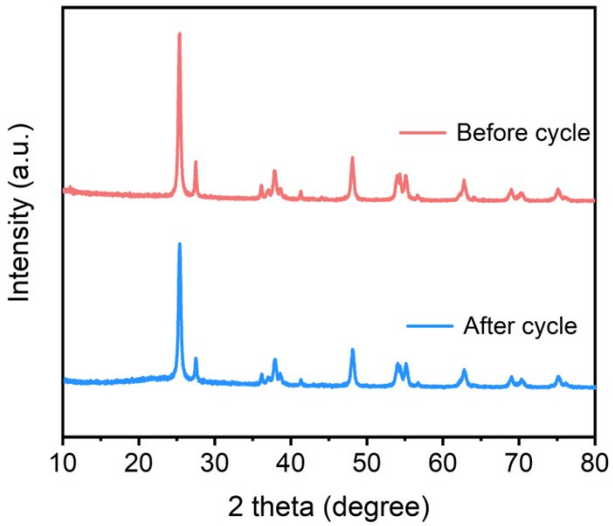

Fig. S4 XRD patterns of P-1 sample before and after cyclic testing.

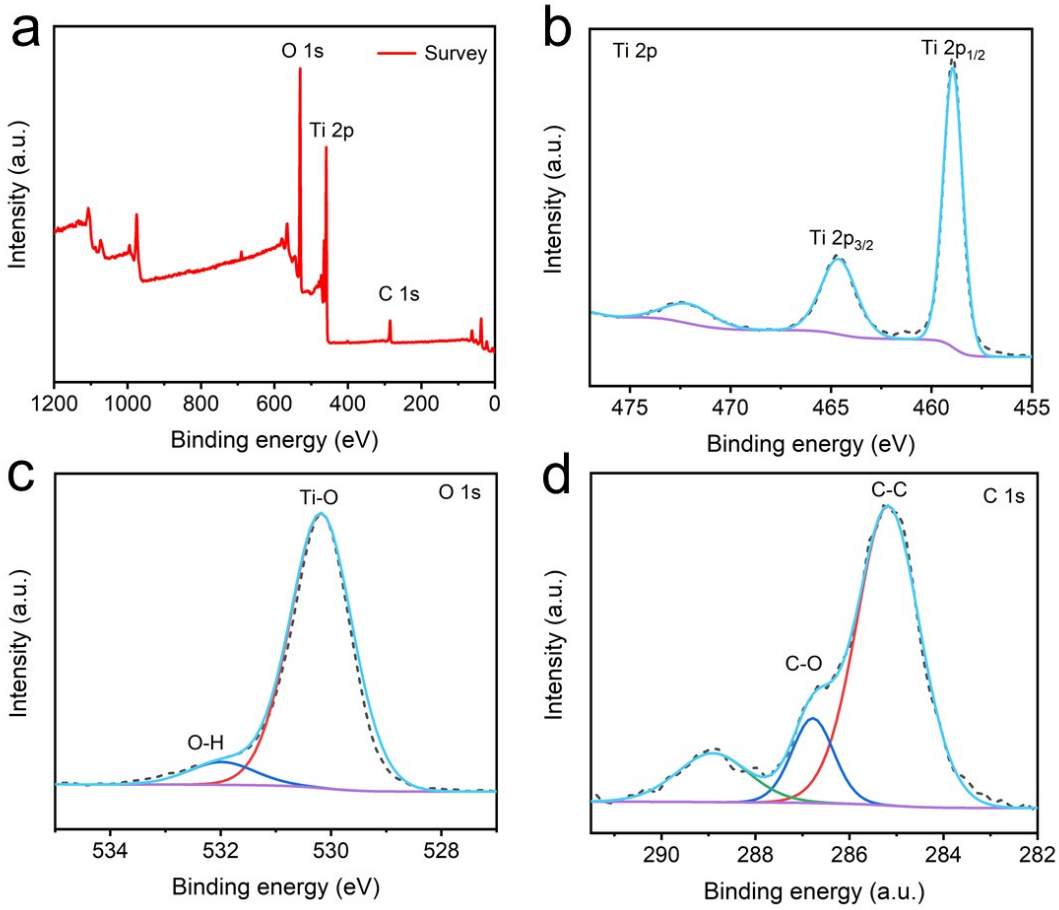

Fig. S5 XPS spectrum of P-1 sample before and after cyclic testing: (a) survey, (b) Ti 2p, (c) O1s and (d) C1s spectrum.

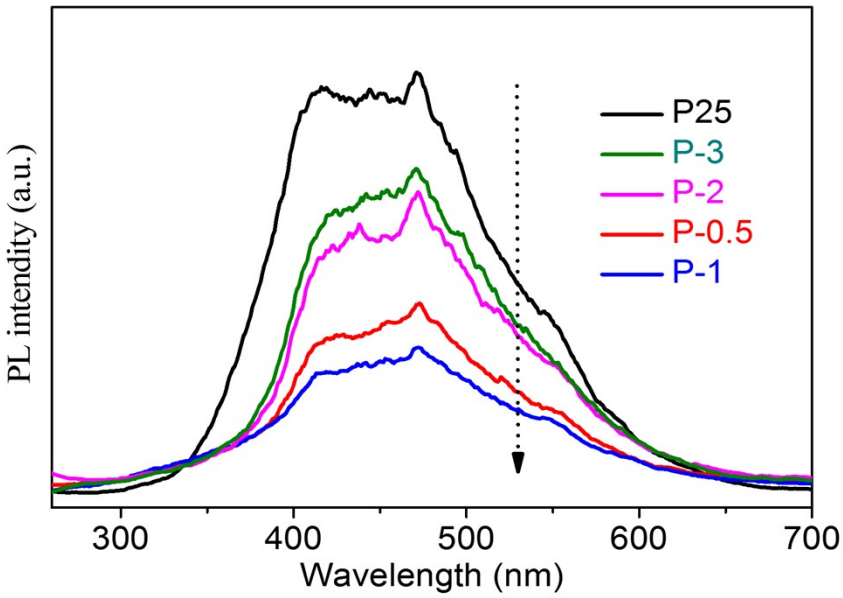

Fig. S6. The PL spectrogram of the obtained samples.

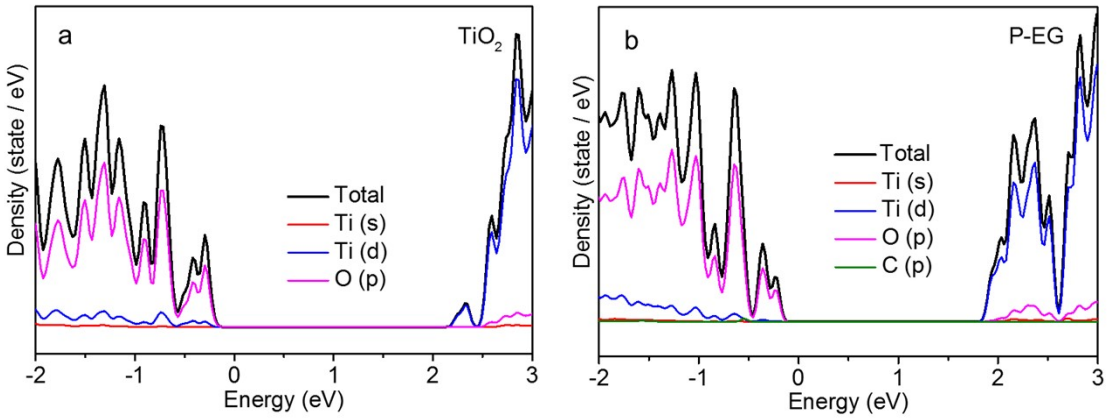

Fig. S7. PDOS of P25 (a) and P-EG (b).