Supporting Information

Visible-light-induced photocatalytic oxidation of polycyclic aromatic hydrocarbons over tantalum oxynitride photocatalysts

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Experimental

5,5-Dimethyl-1-pyrroline-*N*-oxide (DMPO), D_2O, PHE, ANT, ACE, BaA, and PY were obtained from Aldrich Chemical Company. Titanium dioxide photocatalyst (P25, 80% anatase, 20% rutile) was supplied by Degussa. Ta_2O_5 and hydrogen peroxide test strip was purchased from Wako Chemical Company and Macherey-Nagel Company, respectively. Other reagents were obtained from Shanghai Chemical Company. Acetone and dichloromethane were purified by distillation, while other reagents were used without further purification.

The GC was equipped with a flame ionization detector and a split/splitless injector. The injection mode was split injection with the split ratio of 16.5:1. An HP-5 column was used for separation (30 m, 0.25 mm I. D., 0.25 μm film thickness). All quantifications and calculations were based on an external standard and the use of calibration curve. The intermediates were identified by comparing the mass spectra with authentic ones in the NIST 02 library. Mass spectra were recorded at 1 scan s^{-1} under the electron impact of 70 eV and mass range of 30-350 amu. The EPR instrument was operated with the following parameters: microwave frequency 9.76 GHz, microwave power 0.02 W, and modulation frequency 100 kHz.

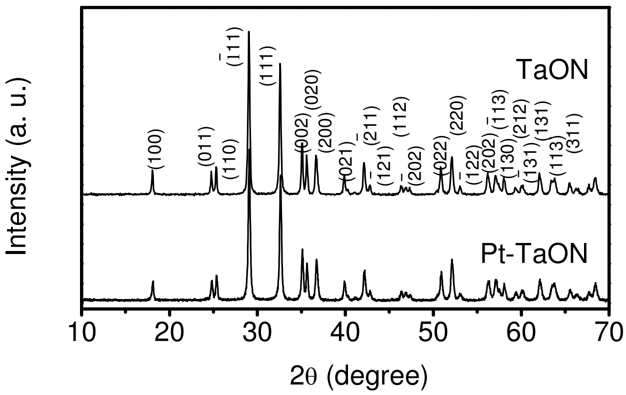


Figure S1. **X-ray diffraction patterns of TaON and Pt-TaON.**

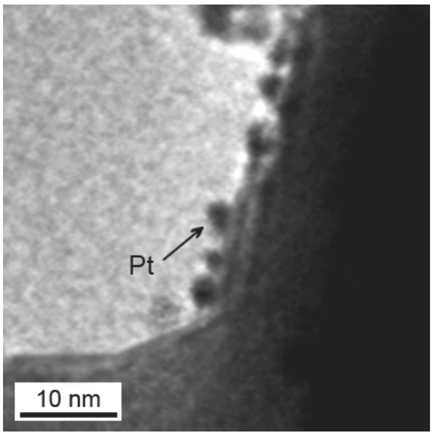


Figure S2. **A TEM image of Pt-TaON.**

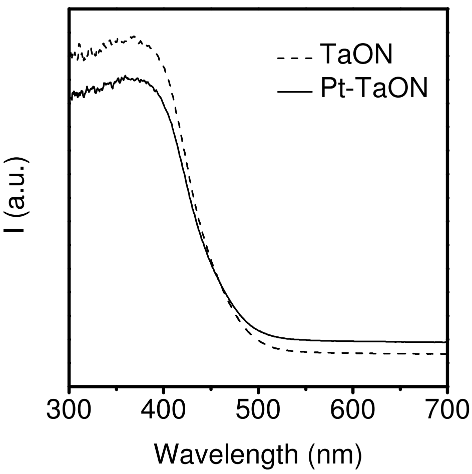


Figure S3. **UV–vis absorption spectra of TaON and Pt-TaON.**

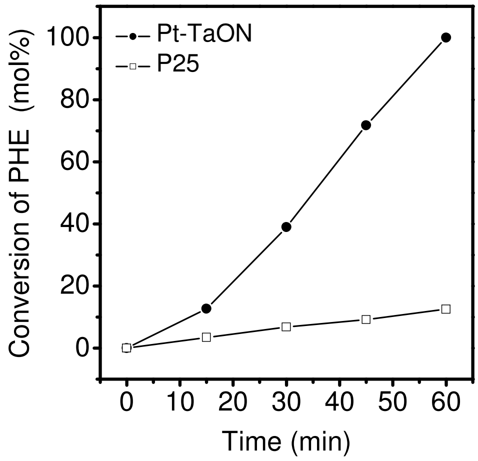


Figure S4. Conversions of PHE over Pt-TaON and P25 under UV light irradiation.

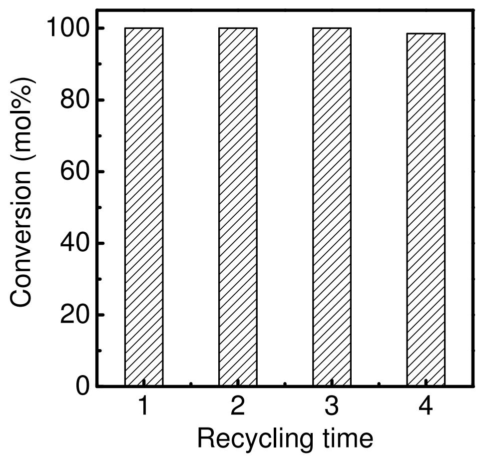


Figure S5. Evaluation of durability of Pt-TaON from the repeatable degradation of PHE. Reaction conditions: reaction time of each run was 2 h, the amount of PHE was 0.003 g, and the initial amount of Pt-TaON was 0.3 g .

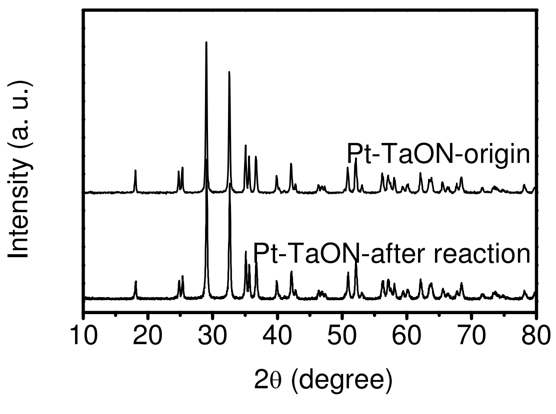


Figure S6. XRD patterns of Pt-TaON before and after PHE photodegradation for 8 h.

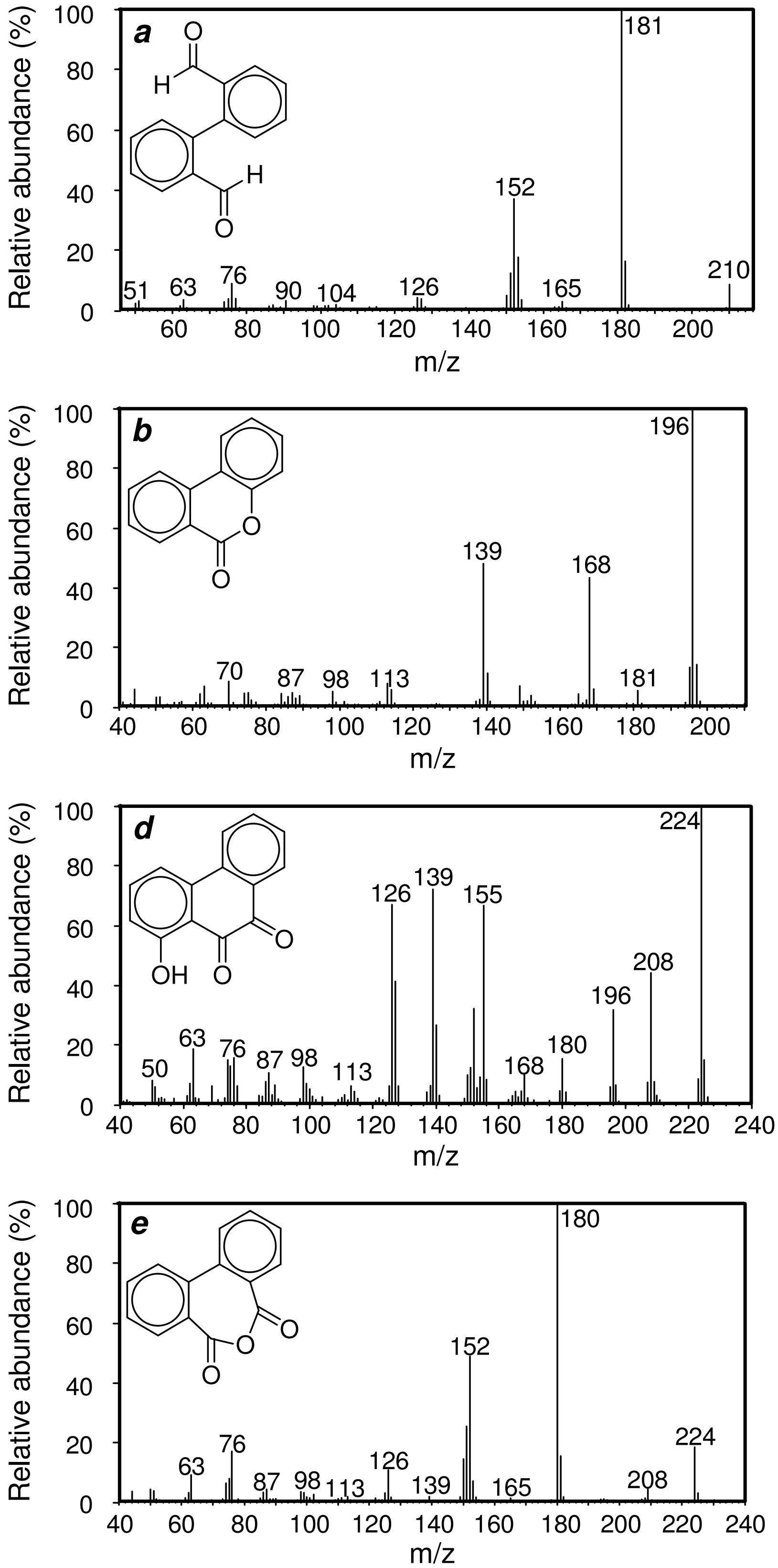
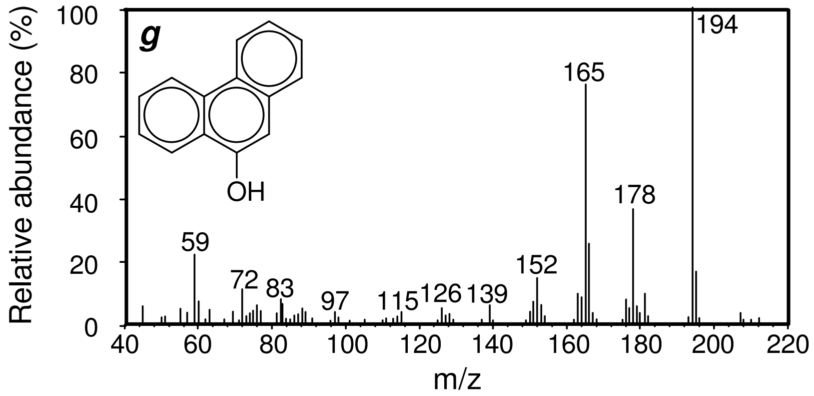


Figure S7. Mass spectra of peaks *a*, *b d*, *e*, *g*, and *h* obtained from the PHE photodegradation over Pt-TaON after 2 h visible light irradiation. (*To be continued*)



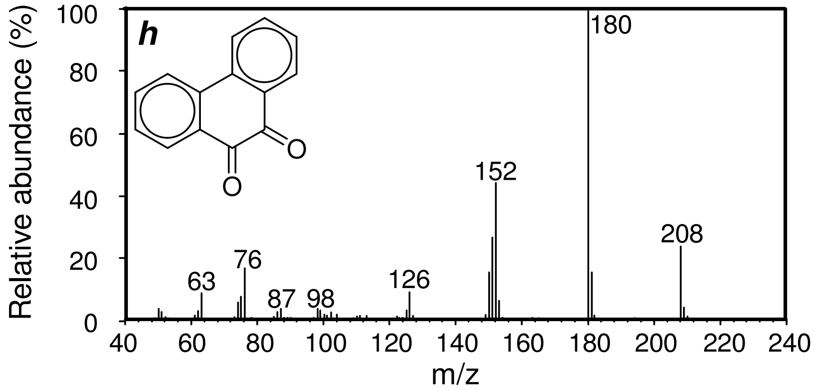
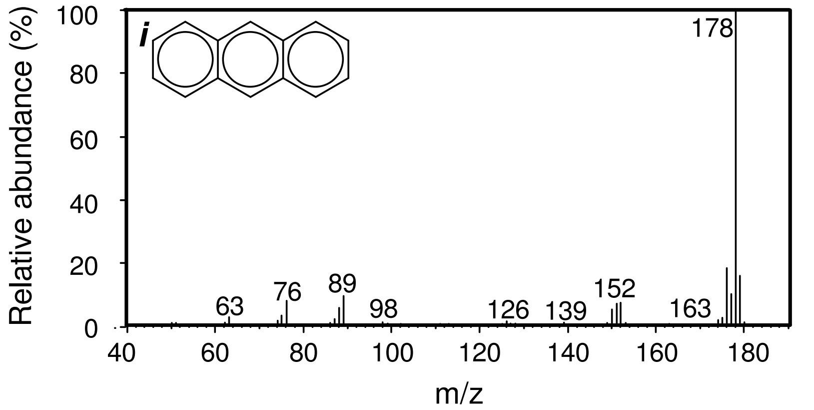


Figure S7. Mass spectra of peaks *a*, *b*, *d*, *e*, *g*, and *h* obtained from the PHE photodegradation over Pt-TaON after 2 h visible light irradiation. (*Continued*)



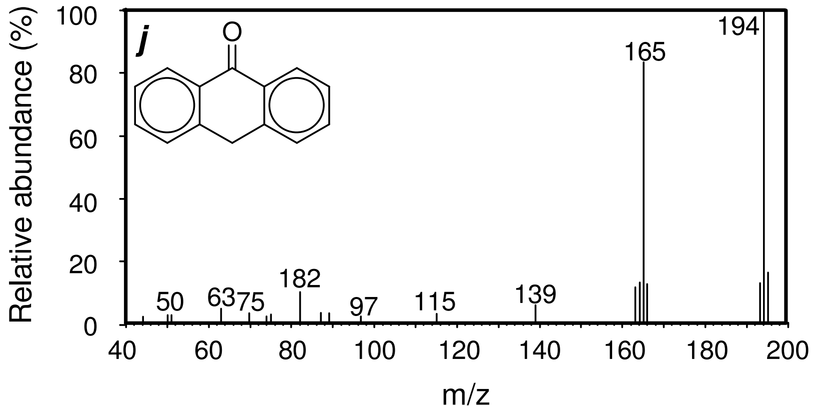


Figure S8. Mass spectra of peaks *i*, *j*, *k*, *m*, and *n* obtained from the ANT photodegradation over Pt-TaON after 2 h visible light irradiation. (*To be continued*)

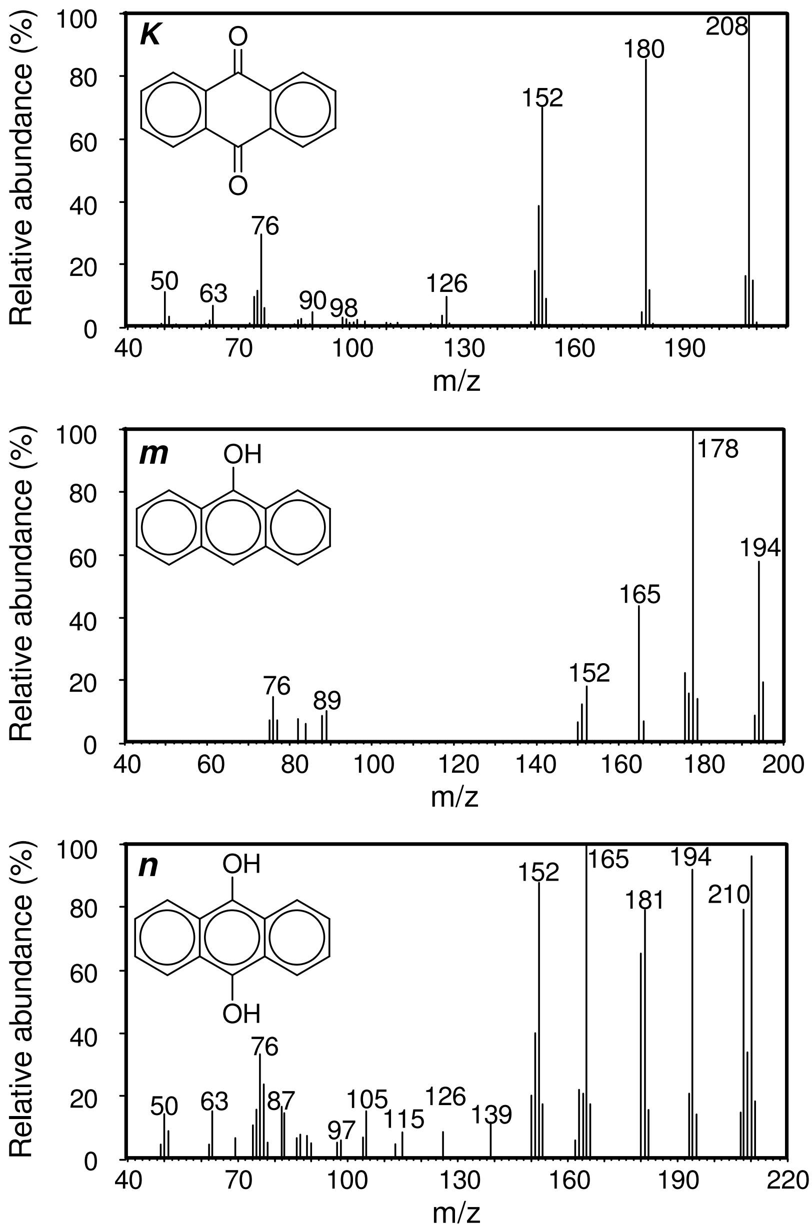


Figure S8. Mass spectra of peaks *i*, *j*, *k*, *m*, and *n* obtained from the ANT photodegradation over Pt-TaON after 2 h visible light irradiation. (*Continued*)

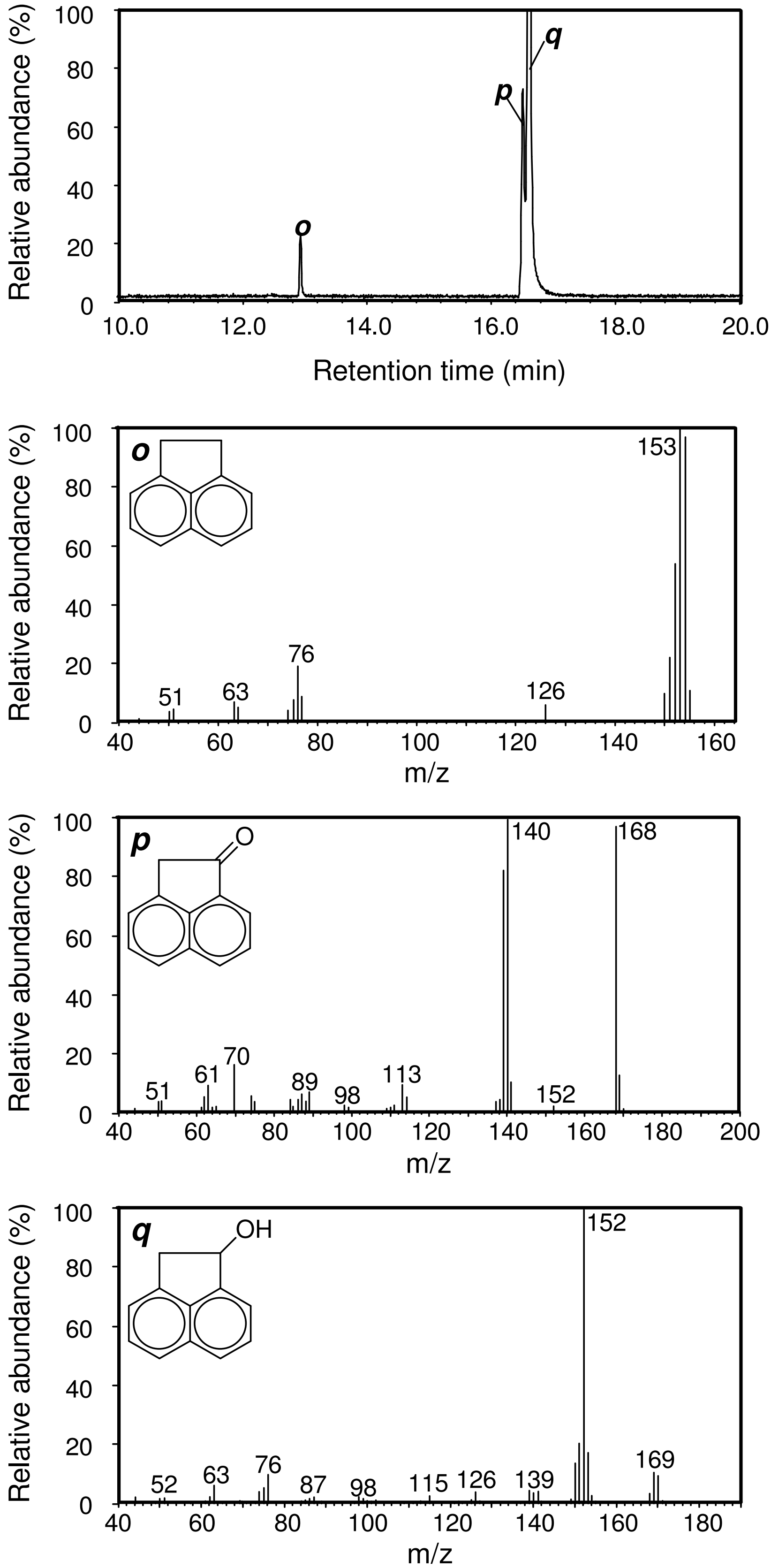


Figure S9. Total ion chromatogram and mass spectra of peaks obtained from the ACE photodegradation over Pt-TaON after 3 h visible light irradiation.

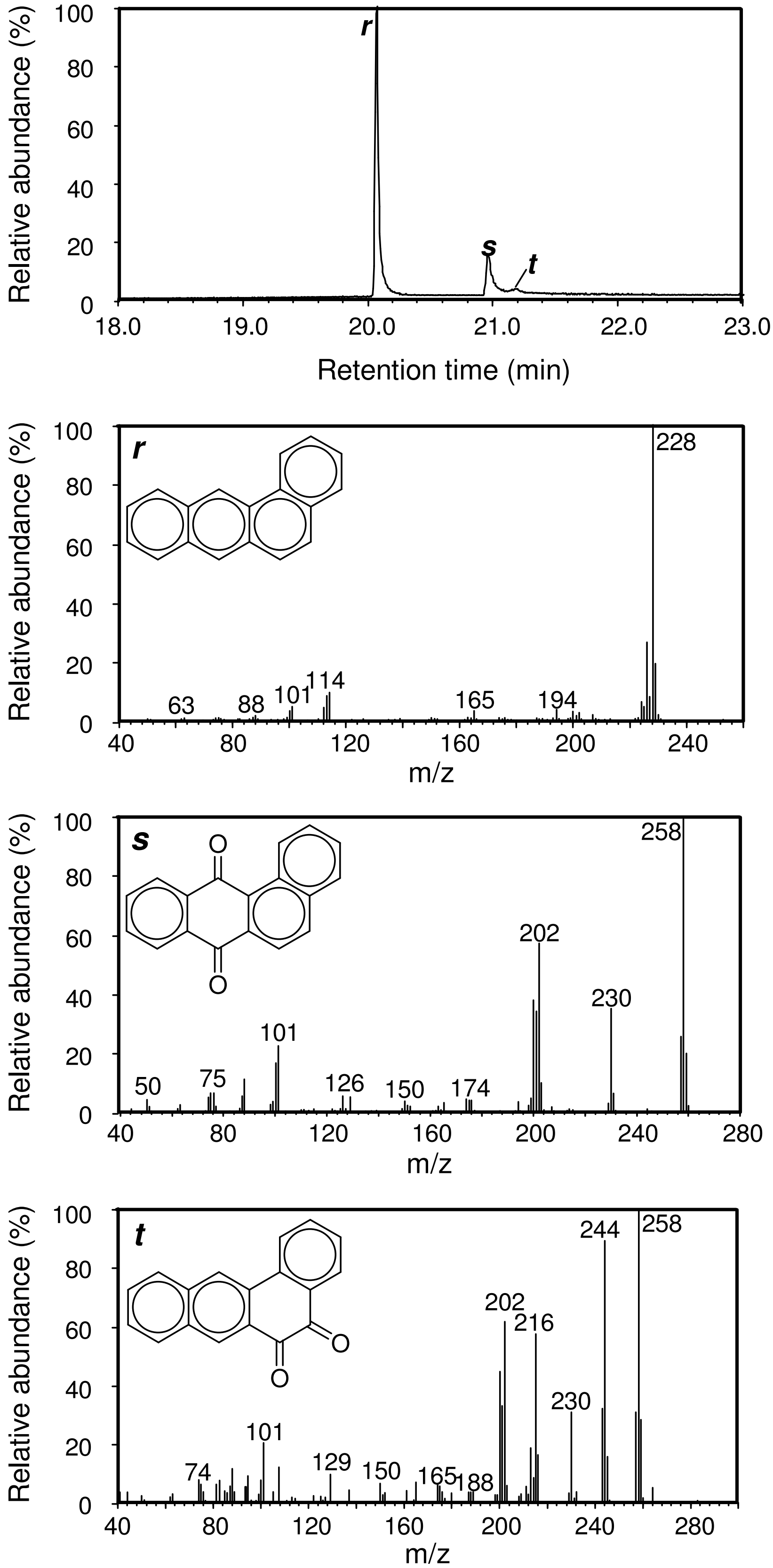


Figure S10. Total ion chromatogram and mass spectra of peaks obtained from the BaA photodegradation over Pt-TaON after 1 h visible light irradiation.

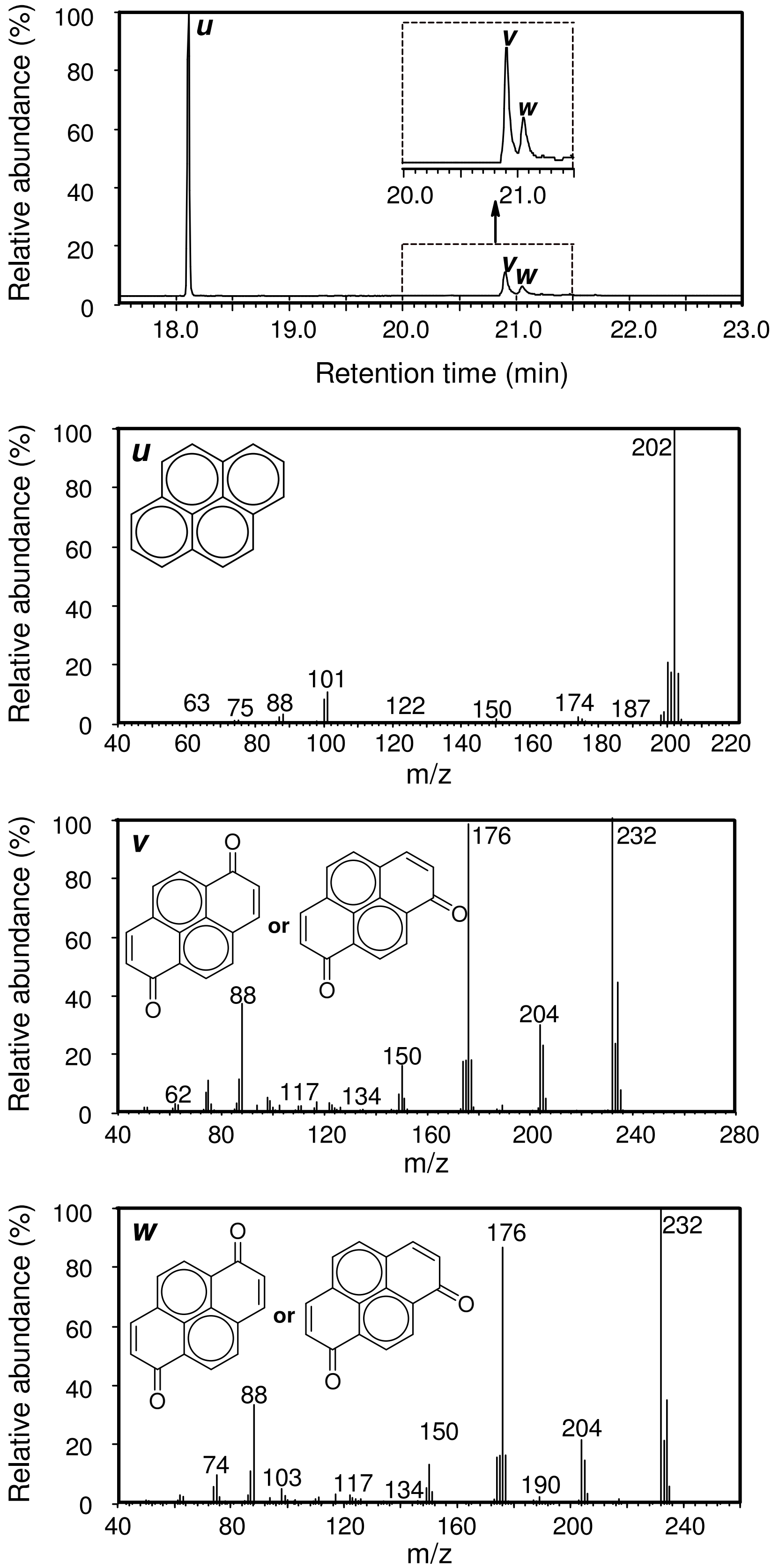
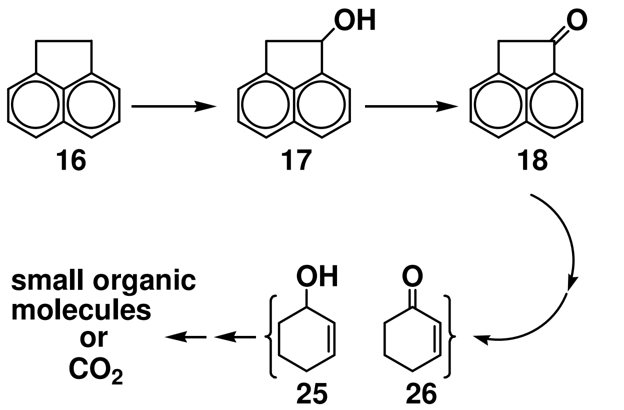
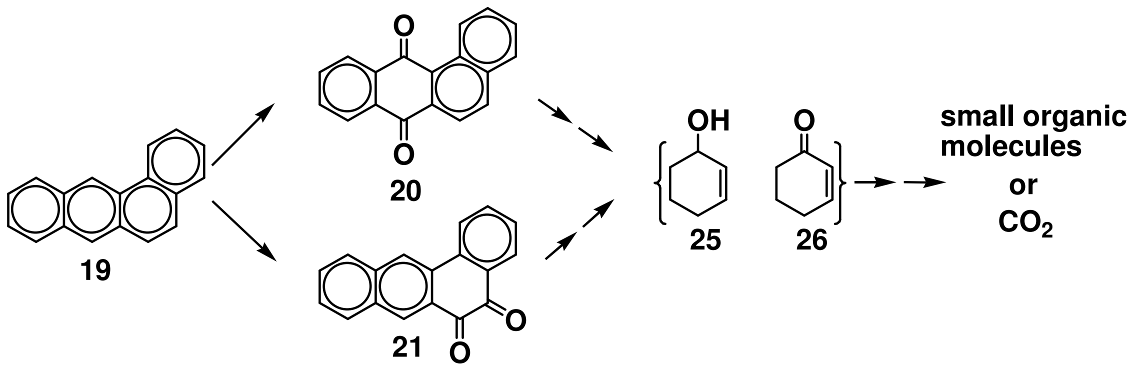


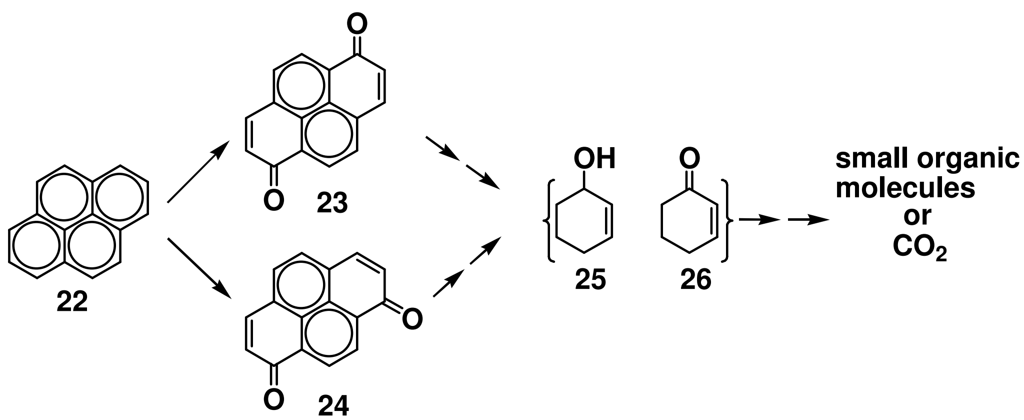
Figure S11. Total ion chromatogram and mass spectra of peaks obtained from the PY photodegradation over Pt-TaON after 3 h visible light irradiation.



Scheme S1. Possible pathway of ACE photodegradation over Pt-TaON under visible light irradiation.



Scheme S2. Possible pathway of BaA photodegradation over Pt-TaON under visible light irradiation.



Scheme S3. Possible pathway of PY photodegradation over Pt-TaON under visible light irradiation.