Synthesis of Au-decorated three-phase-mixed TiO_2/phosphate modified active carbon nanocomposites as easily-recycled efficient photocatalysts for degrading high-concentration 2,4-DCP

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How to calculate percentage of each phase of MTO

The percentage of each phase in MTO can be calculated from integrated intensities of (101) anatase (2θ = 25.3°), (110) rutile (2θ = 27.4°), and (121) brookite (2θ = 20.8°) peaks, using the following equations:

$$Wa= \frac{KaAa}{KaAa+Ar+KbAb}$$

$$Wr= \frac{Ar}{KaAa+Ar+KbAb}$$

$$Wb= \frac{KbAb}{KaAa+Ar+KbAb}$$

where Wa, Wr and Wb represent mass fractions of anatase, rutile and brookite, respectively, while Aa, Ar and Ab correspondingly represent the integrated intensities for each polymorph. Ka and Kb stand for correction coefficients, which have values of 0.886 and 2.721[23], respectively.

Table 1

Titania phase content and surface area of products

Samples	HCl (mL)	Relative phase content (%)			S_{BET} (m^2/g)
		A	R	B	
1MTO	1	65.5	10.3	24.2	77.7
2MTO	2	64.2	11.0	24.8	87.15
3MTO	3	62.8	11.7	25.5	124.2
4MTO	4	54.7	12.9	32.3	98.0

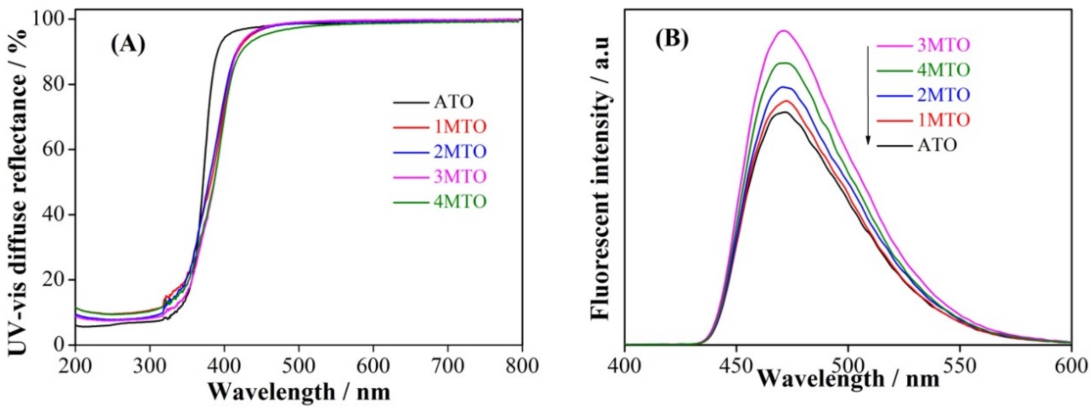

Fig. S1 DRS spectra (A) and FS spectra related to the amount of produced •OH radicals under UV-vis light irradiation (B) of ATO and XMTO. (X stands for 1,2,3 and 4 ml of HCl, ATO for anatase TiO_2 and MTO for mixed-phase TiO_2. It is the same elsewhere unless stated.

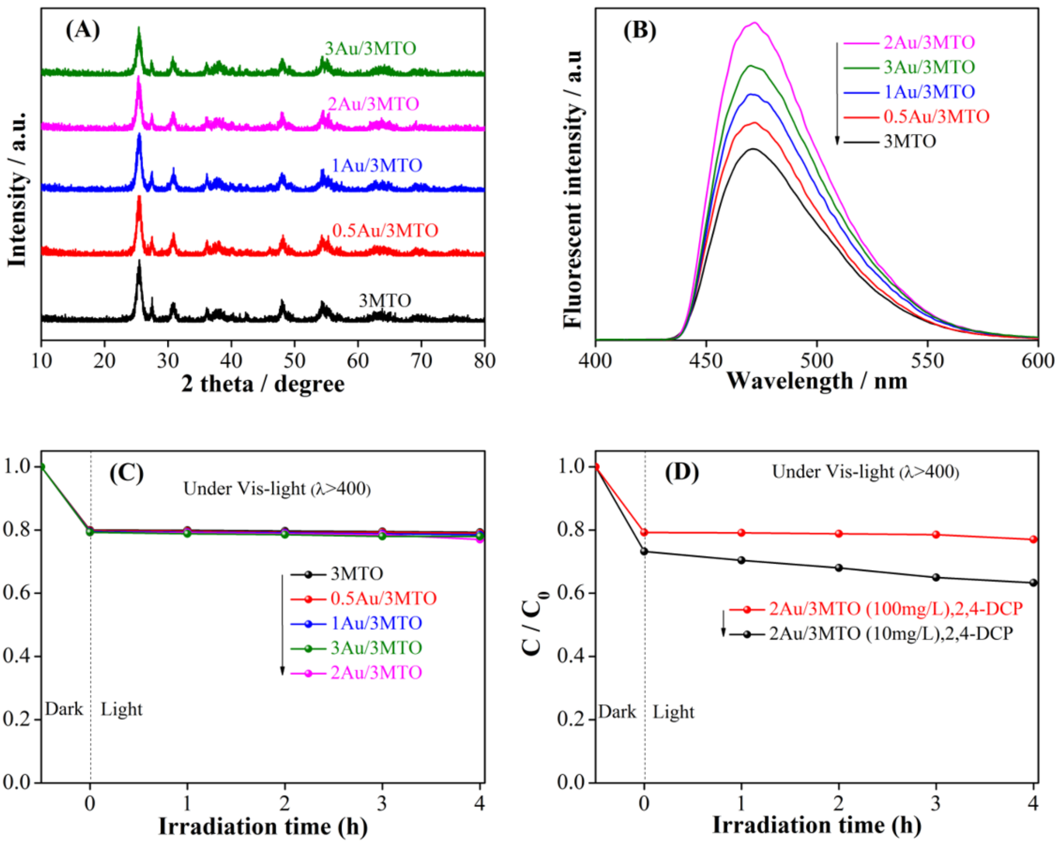

Fig. S2 XRD patterns (A), FS spectra related to the amount of •OH radicals (B), photocatalytic activities (C) of 3MTO and YAu/3MTO under UV-vis light irradiation for 2,4-DCP (100 mg/L) degradation and the activity of 2Au/3MTO for different concentrations of 2,4-DCP degradation under vis-light irradiation (D).

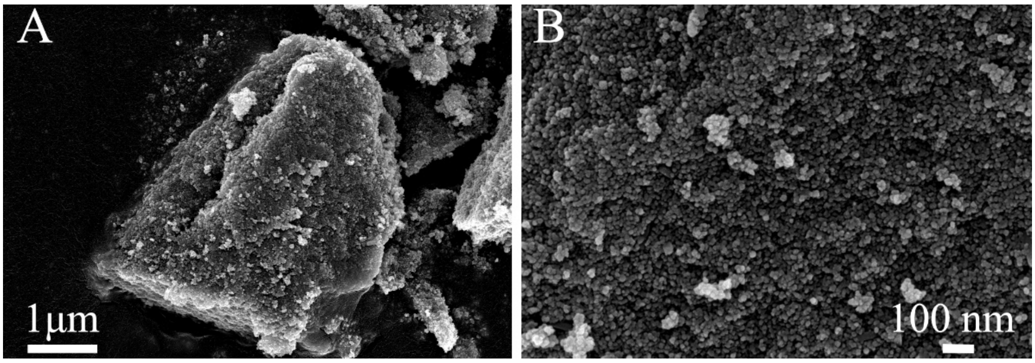

Fig. S3 SEM images of (2Au/3MTO)/3P-10AC.

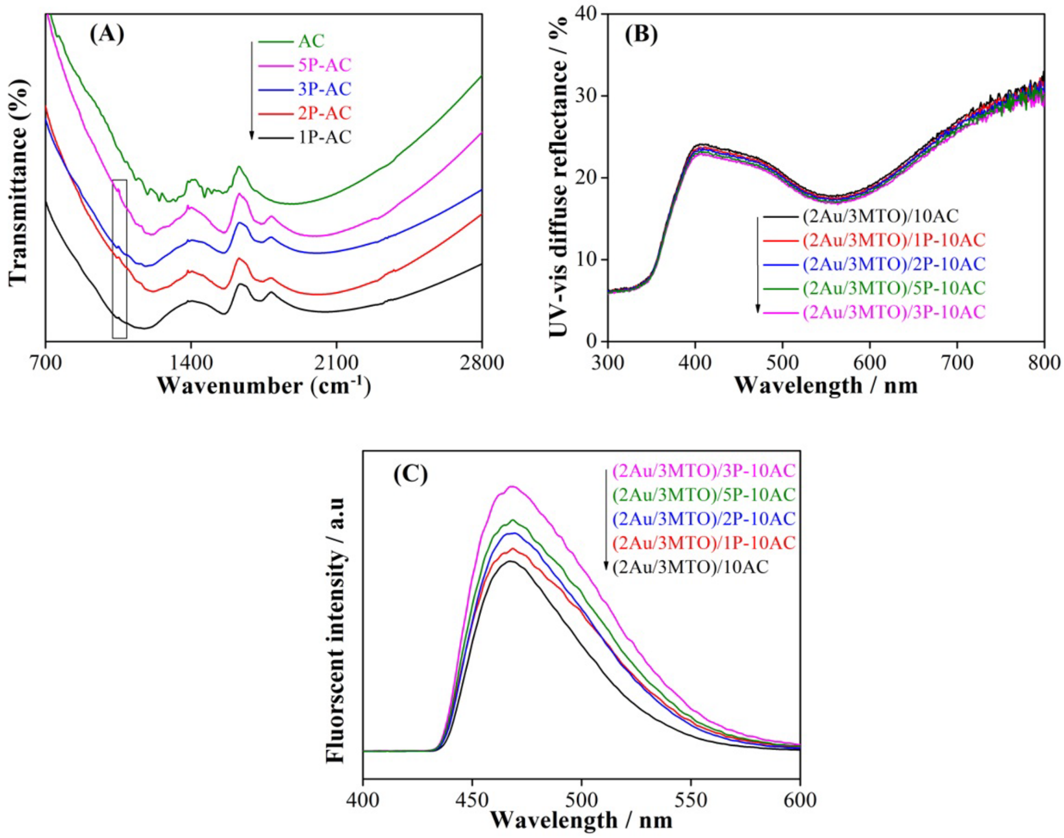

Fig. S4 FTIR spectra of AC and ZP-AC (A), DRS spectra (B), and FS spectra related to the amount of •OH radicals (C) of (2Au/3MTO)/10AC and (2Au/3MTO)/ZP-10AC.

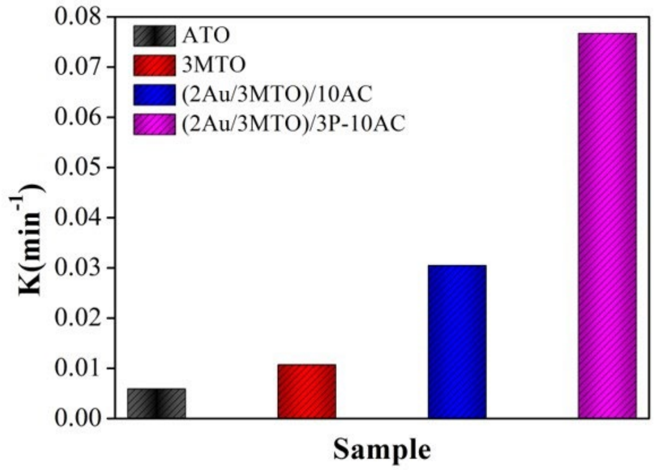

Fig. S5 Pseudo-first order kinetic of ATO, 3MTO, (2Au/3MTO)/10AC and (2Au/3MTO)/3P-10AC.

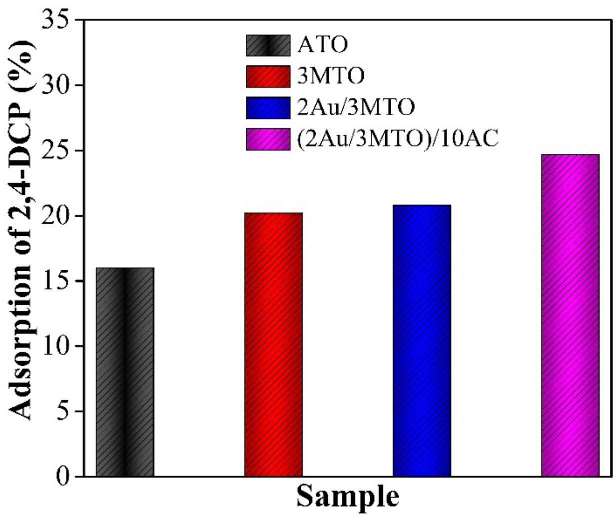

Fig. S6 Adsorption rate of 2,4-DCP over ATO, 3MTO, 2Au/3MTO and (2Au/3MTO)/10AC under dark for 30 min.

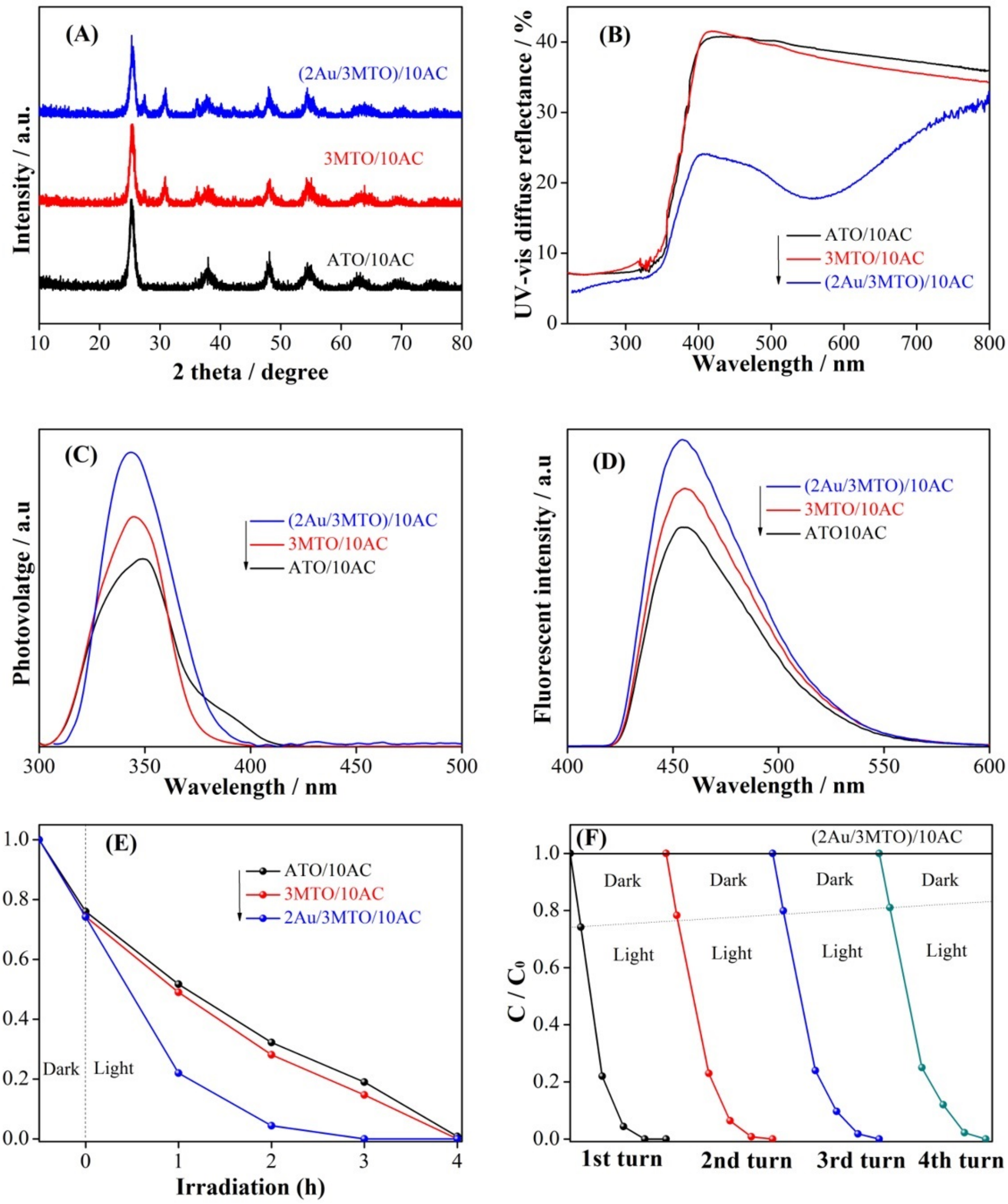

Fig. S7 XRD patterns (A), DRS spectra (B), SPS spectra (C) and FS spectra related to the amount of •OH radicals (D) of TO/10AC, 3MTO/10AC, 2Au/3MTO and (2Au/3MTO)/10AC and photocatalytic activities (E) of TO/10AC, 3MTO/10AC, 2Au/3MTO and (2Au/3MTO)/10AC and (F) stability test of (2Au/3MTO)/10AC under UV-vis light irradiation for 2,4-DCP degradation.

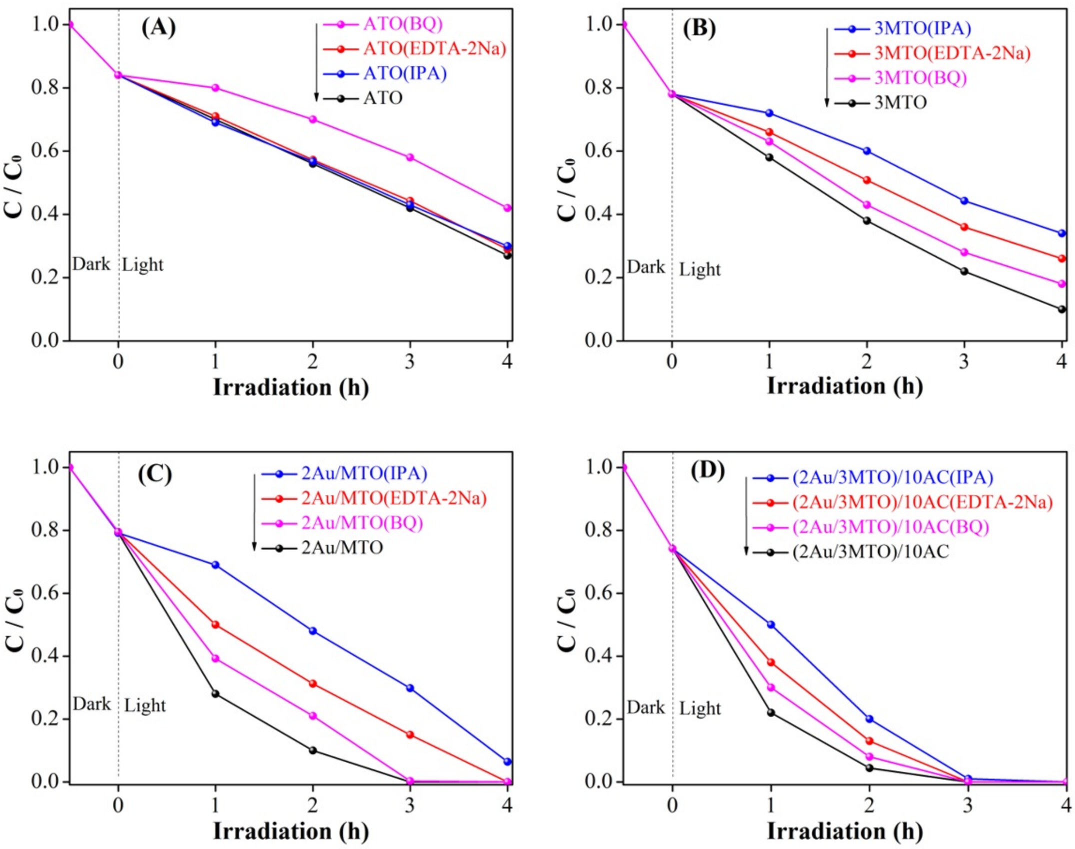

Fig. S8 Photocatalytic degradation of 2,4-DCP in the presence of IPA, BQ and EDTA-2Na over ATO (A), 3MTO (B), 2Au/3MTO (C) and (2Au/3MTO)/10AC (D) under UV vis-light irradiation.