Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Photocatalytic oxidation of small molecule hydrocarbons over Pt/TiO_2 nanocatalysts

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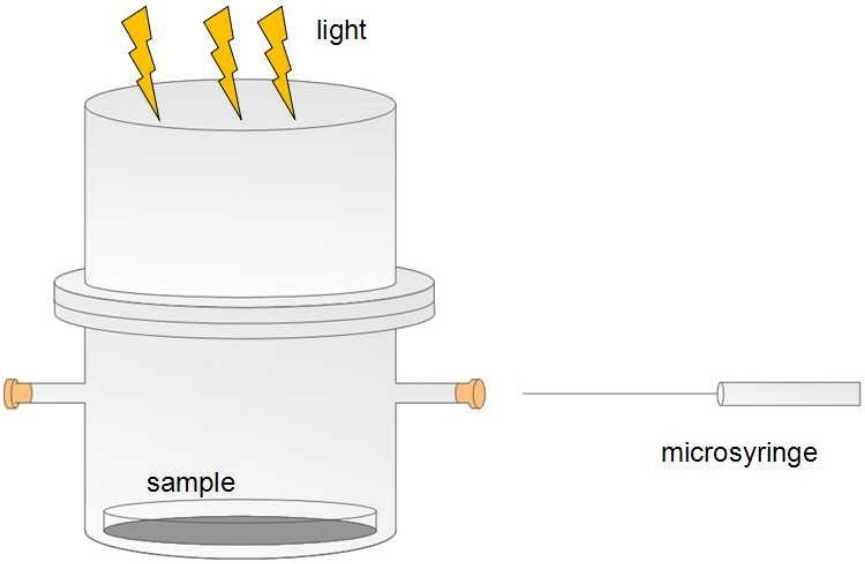

Figure S1 The sketch of photoreaction in a sealed quartz reactor

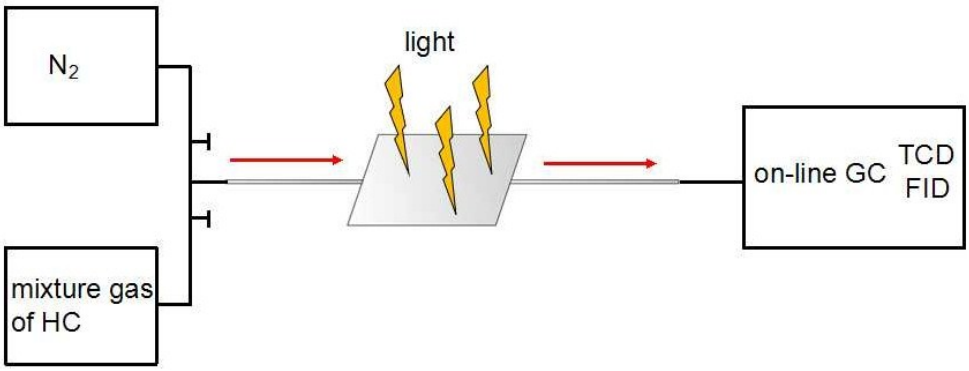

Figure S2 The schematic diagram of continues flow photocatalytic test

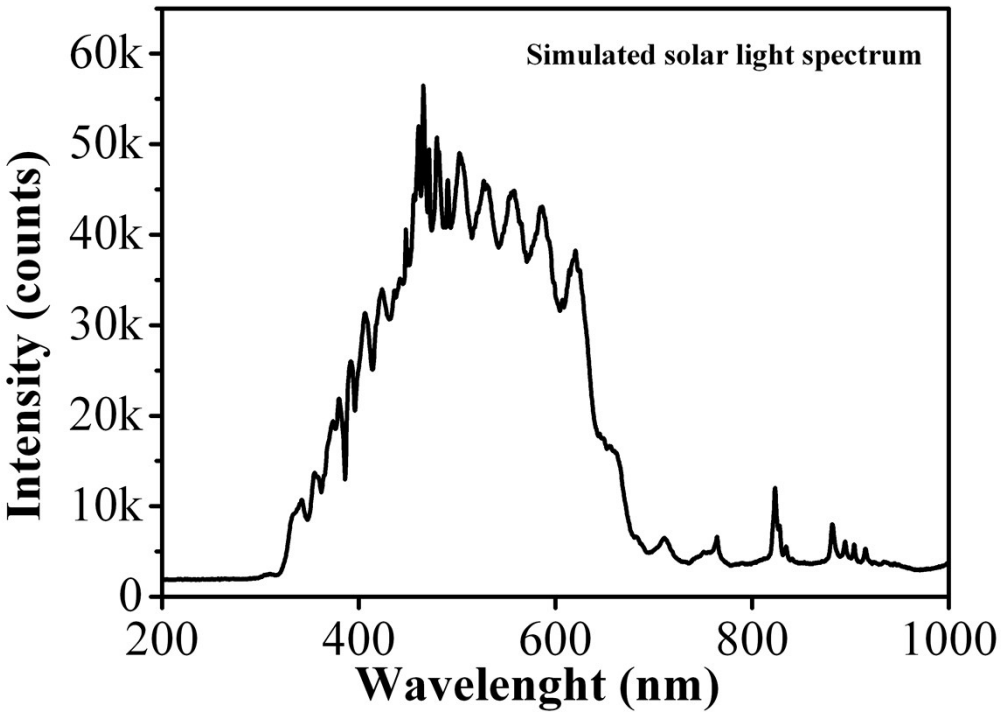

Figure S3 The spectrum of simulated solar light

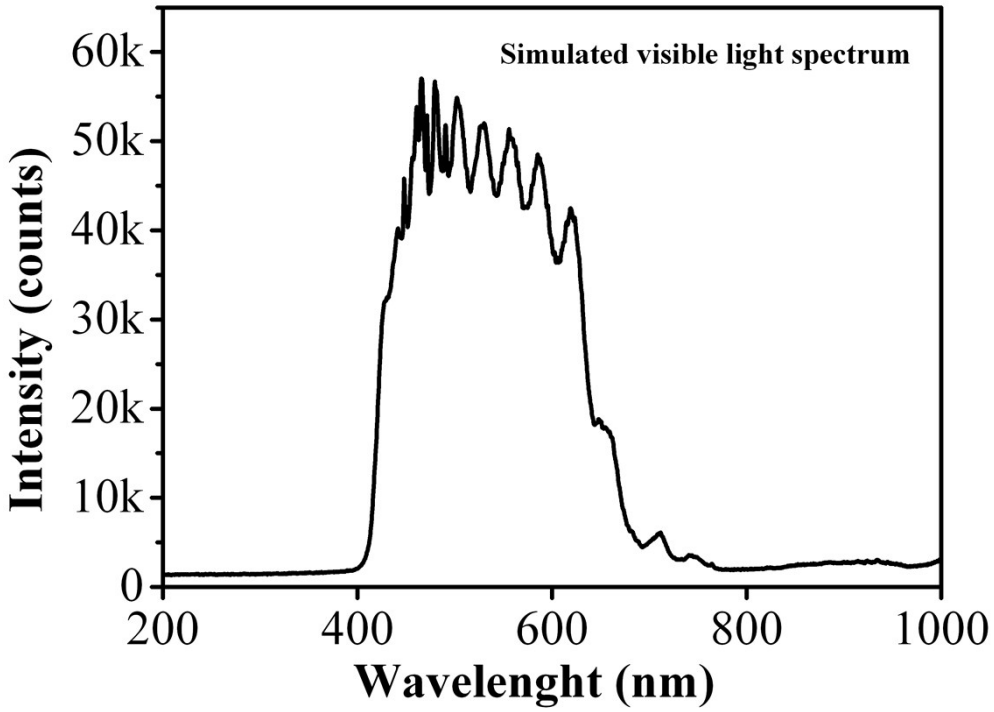

Figure S4 The visible light spectrum of simulated solar light

S5：The turnover number (TON) calculations:

For the C_2H_4:

Reaction formula : $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

The number of electrons gain and loss in the reaction : $12 \cdot e^{-1}$

The amount of substance 10 mL C_2H_4：$n_1=0.446\times10^{-3}$ mol

The total amount of substance of electrons gain and loss in the photo-degradation of 10 mL C_2H_4: $n_2=n_1\times12$ mol $=5.3525\times10^{-3}$ mol

For the 0.2 g Pt (0.2%)/P25 catalyst:

The amount of substance Pt: $n_{Pt}=2.05\times10^{-6}$ mol

The amount of substance TiO_2: $n_{TiO2}=2.45\times10$-3 mol

For Pt: $TON_{Pt}=n_2/n_{Pt}=2.61\times10^3$

For TiO_2: $TON_{TiO2}=n_2/n_{TiO2}=2.18$

For the C_2H_6:

Reaction formula : $C_2H_6 + 3.5O_2 \rightarrow 2CO_2 + 3H_2O$

The number of electrons gain and loss in the reaction : $14 \cdot e^{-1}$

The amount of substance 10 mL C_2H_6: $n_1 = 0.446 \times 10^{-3}$ mol

The total amount of substance of electrons gain and loss in the photo-degradation of 10 mL C_2H_4: $n_2 = n_1 \times 14$ mol $= 6.244 \times 10^{-3}$ mol

For the 0.2 g Pt (0.2%)/P25 catalyst:

The amount of substance Pt: $n_{Pt} = 2.05 \times 10^{-6}$ mol

The amount of substance TiO_2: $n_{TiO2} = 2.45 \times 10\text{-}3$ mol

For Pt: $TON_{Pt} = n_2/n_{Pt} = 3.05 \times 10^3$

For TiO_2: $TON_{TiO2} = n_2/n_{TiO2} = 2.55$

For the C_3H_6:

Reaction formula : $C_3H_6 + 4.5O_2 \rightarrow 3CO_2 + 3H_2O$

The number of electrons gain and loss in the reaction : $18 \cdot e^{-1}$

The amount of substance 10 mL C_3H_6: $n_1 = 0.446 \times 10^{-3}$ mol

The total amount of substance of electrons gain and loss in the photo-degradation of 10 mL C_3H_6: $n_2 = n_1 \times 18$ mol $= 8.028 \times 10^{-3}$ mol

For the 0.2 g Pt (0.2%)/P25 catalyst:

The amount of substance Pt: n_{Pt} = 2.05×10^{-6} mol

The amount of substance TiO_2: n_{TiO2} = 2.45×10-3 mol

For Pt: $TON_{Pt} = n_2/n_{Pt}$ = 3.92×10^3

For TiO_2: $TON_{TiO2} = n_2/n_{TiO2}$ = 3.23

For the C_3H_8:

Reaction formula : $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

The number of electrons gain and loss in the reaction : 20 • e^{-1}

The amount of substance 10 mL C_3H_8： n_1 = 0.446×10^{-3} mol

The total amount of substance of electrons gain and loss in the photo-degradation of 10 mL C_3H_8: $n_2 = n_1$×20 mol = 8.92×10^{-3} mol

For the 0.2 g Pt (0.2%)/P25 catalyst:

The amount of substance Pt: n_{Pt} = 2.05×10^{-6} mol

The amount of substance TiO_2: n_{TiO2} = 2.45×10-3 mol

For Pt: $TON_{Pt} = n_2/n_{Pt}$ = 4.35×10^3

For TiO_2: $TON_{TiO2} = n_2/n_{TiO2}$ = 3.64