Support Information

for

Bio-template Synthesis of Spirulina/TiO_2 Composite with Enhanced Photocatalytic Performance

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1. The control group of CPC/TiO_2

We have conducted further experiments to support the effect of spirulina-hierarchical structure. A new TiO_2 sample was prepared with only photosynthesis pigment. The sample was then characterized by scanning electron microscope (SEM) and X-Ray Diffraction (XRD) test. The photocatalytic performance was tested by degrading methyl orange (MO).

Experimental

Preparation: 1.0 g spirulina was added into 44.0 mL distilled water and then disrupted by the ultrasonic wave for 10 min to let the photosynthesis pigments release out. The disrupted cells were centrifugal separated at 8000 r/min for 10 min and the pigments solution was transferred into a 100 mL beaker. 6.0 g $Ti(SO_4)_2$ was dissolved into the pigments solution and then transferred into a 50 mL teflon-lined stainless steel reactor and treated at 180 ^oC for 12 h. The pH of the reaction product was adjusted to 7 by distilled water. After vacuum filtration, the precipitate was dried at 80 ^oC to acquire CPC/TiO_2.

Characterization: The morphology of CPC/TiO_2 was observed by SEM (Hitachi, SU-70). The X-ray diffraction (XRD) patterns of the photocatalysts were observed by an X'Pert Pro diffractometer using Cu-Kα a radiation (λ=0.15418 nm).

Photocatalytic performance: 1.5 g of sample was dispersed into a 1500 mL 10 $mg \cdot L^{-1}$ MO aqueous solution in a beaker. The beaker was then kept in darkness for 24 h to avoid the physical adsorption affecting the degradation rate. A 35 W halogen lamp was used as the light source. The reaction temperature was 20 ^oC controlled by circulating water cooling. The UV-vis absorption patterns of photocatalytic degraded solution samples were recorded by ultraviolet and visible spectrophotometer (Shimazu, UV-2550).

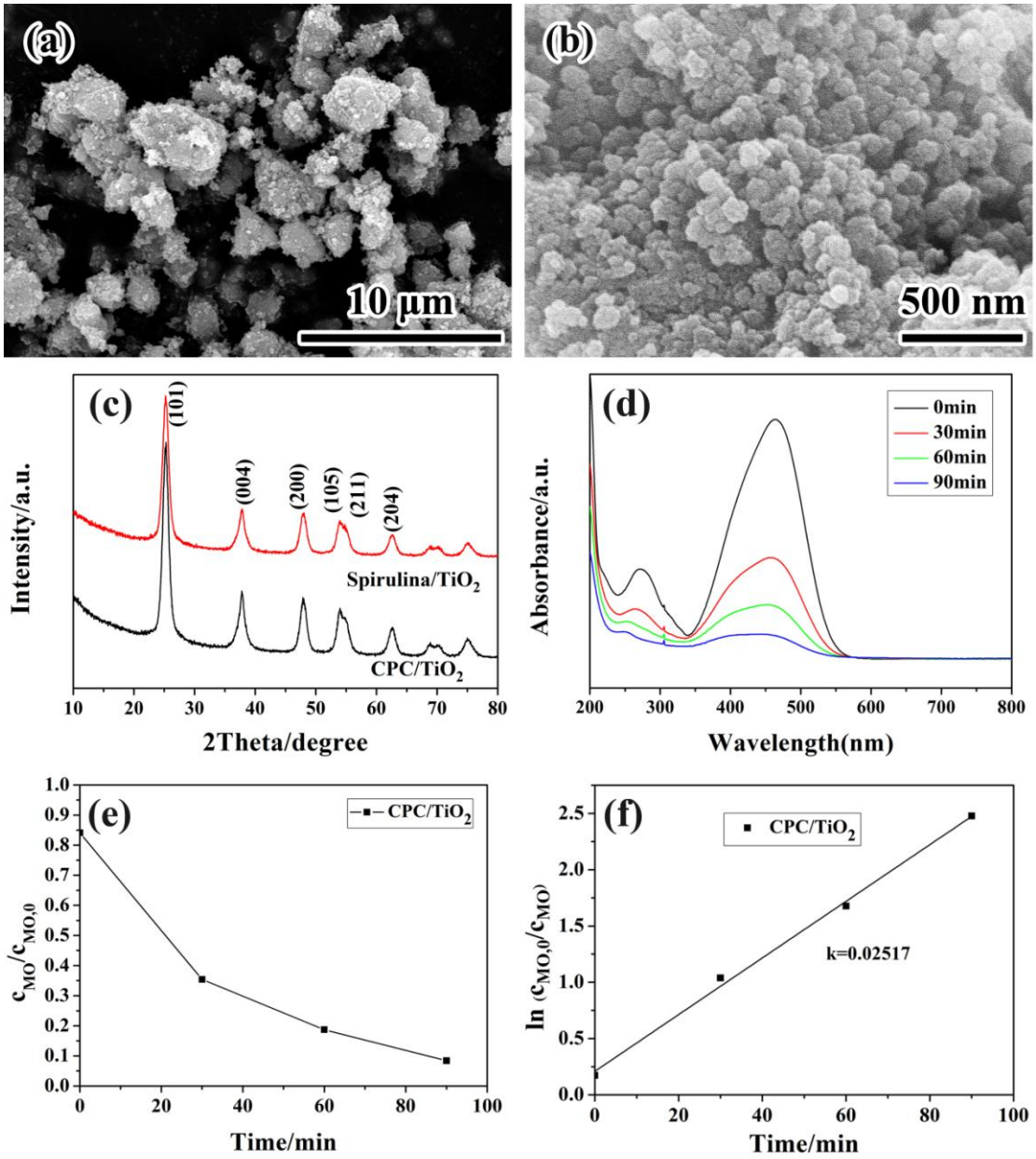

Fig. S1 (a), (b) Typical morphology of CPC/TiO_2; (c) XRD patterns of CPC/TiO_2 and spirulina/TiO_2; (d) UV-vis spectra of MO solution degraded by CPC/TiO_2; (e) Degradation line of CPC/TiO_2; (f) Photo-degradation kinetics line of CPC/TiO_2.

2. The percentage of TiO_2 in spirulina/TiO_2

In order to show the enhancement of photocatalytic performance more precisely, we have conducted experiments to test the real content of TiO_2 in spirulina/TiO_2. We put 1.000 g spirulina/TiO_2 into muffle furnace to burn up the spirulina at 500 ^oC for 4h. The spirulina/TiO_2 finally changed the yellow color into white, which means that the spirulina was burn up. We

weighed the residuals and the result was 0.678 g. Therefore, the content of TiO_2 in spirulina/TiO_2 was 67.8%, which basically matched the calculation as follows.

The weight of $Ti(SO_4)_2$ was 6.0 g, as mentioned in *Experimental*.

The reaction formula was: $Ti(SO_4)_2 + 2H_2O = TiO_2 + 2H_2SO_4$

$M[Ti(SO_4)_2] = 239.88\ g \cdot mol^{-1}$; $M[TiO_2] = 79.87\ g \cdot mol^{-1}$

Then $m(TiO_2) = m[Ti(SO_4)_2] \cdot M[TiO_2] / M[Ti(SO_4)_2] = 2.0\ g$

$w(TiO_2) = m(TiO_2)/[m(spirulina)+m(TiO2)] = 2.0 /(2.0 +1.0) = 66.7\%$

As known to us, the TiO_2 was the one that had the ability of photocatalytic reaction, while spirulina did not have. That means the 67.8% TiO_2 in spirulina/TiO_2 reached twice photocatalytic ability as much as 100% TiO_2 in pure TiO_2.