Electronic Supplementary Material (ESI) for RSC Advances.

1. Experimental

1.1 Primary reagent

The reagents used in the experiment were $FeCl_3 \cdot 6H_2O$, anhydrous sodium carbonate, 1,3,5-benzenetricarboxylic acid (98%), isopropyl titanate (97%), absolute ethanol, HF (40%), methylene blue, hydrogen peroxide (30%) were of analytical grade, and the water used in the experiment was distilled water.

1.2 Synthesis of co-exposed of {001} and {101} TiO_2

Co-exposed of {001} and {101} TiO_2[9-10, 39-41] was prepared according to the reported method. Briefly, 20 mL of TTIP was directly mixed with 3 mL of 40% HF, and the mixed solution was transferred to an autoclave, which was sealed and placed in an oven at 200°C for 24 hours. After the reaction was completed, the autoclave was naturally cooled in the air. The precipitate was separated by centrifugation and centrifuged at 4000 r/min for 30 min. Then, the obtained precipitate was washed to pH =7, and dried in an oven at 60°C overnight. The final powder was calcined in air at 450°C for 6 hours to remove residual organic matter and F ions. Thereby Co-exposed of {001} and {101} TiO_2 is obtained.

2. Results and discussion

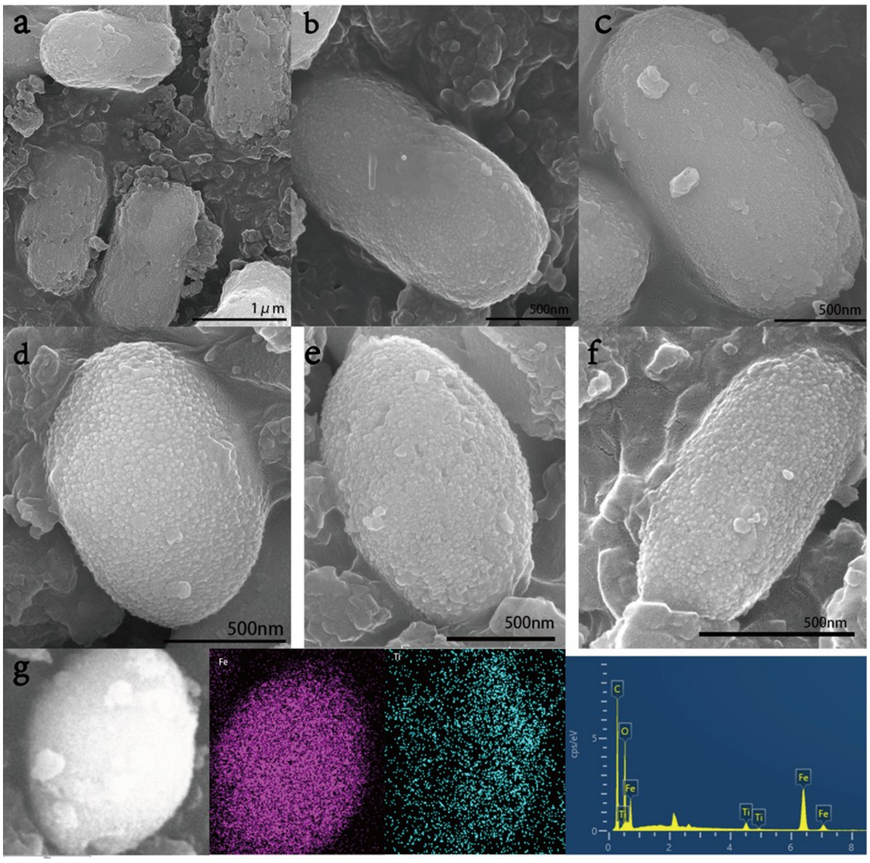

Fig. S1.SEM images and EDS mapping of wt.%TiO_2/MIL-100(Fe) nanocomposites: (a)0%, (b)10%,(c)20%,(d)30%,(e)40%,(f)50% and (g)mapping images of 30%TiO_2/MIL-100(Fe)

Figures.S1(a)-(f) are SEM images of 0%-50% TiO_2/MIL-100(Fe), respectively. The samples of 30% TiO_2/MIL-100(Fe) composites retained the most complete egg-like type. With the increase of TiO_2, the 40% and 50% TiO_2/MIL-100(Fe) composites are gradually narrower in diameter and longer in length.In addition, the element distribution map showed that the Fe and Ti elements were uniformly distributed on the TiO_2 and MIL-100(Fe) samples, indicating that the TiO_2 was uniformly distributed on the MIL-100(Fe) carrier, which was consistent with the SEM results. The appearance of characteristic peaks of Fe, Ti and O elements on the EDS map further demonstrates the successful preparation of TiO_2 and MIL-100(Fe) composites.

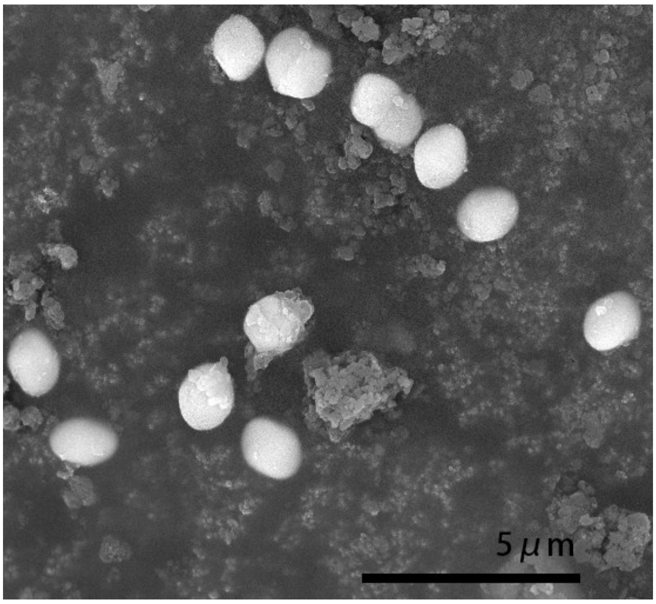

Fig. S2.SEM images of 30%TiO_2/MIL-100(Fe)

Figure.S2 is an SEM image of a 30% TiO_2/MIL-100 (Fe) composite showing that the 30% TiO_2/MIL-100(Fe) composite is a uniform egg-like morphology.

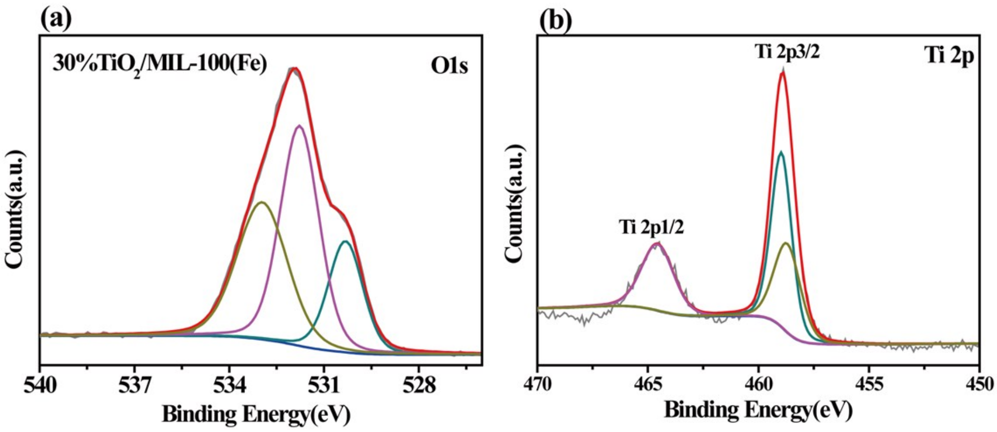

Fig. S3.XPS pattern measurement of 30% TiO_2/MIL-100(Fe): (a) O1s binding energy spectra,(b) Ti 2p binding energy spectra.

It can be seen from Fig.S3(a) that the high-resolution XPS spectrum of O1s consists of three component peaks at 531.4 eV, 530.4 eV and 528.8 eV. Fig. S3(b) shows that the binding energy peaks at 458.8 eV and 464.5 eV correspond to Ti 2p3/2 and Ti 2p1/2 of Ti atoms, belonging to Ti^{4+} in TiO_2/MIL-100(Fe).An additional peak appeared at 458.1 eV, and in the presence of Fe-O-

Ti bond, Fe-O-Ti bond was formed during the growth of TiO_2/MIL-100(Fe), in which part of the Ti atom was replaced by Fe atom.

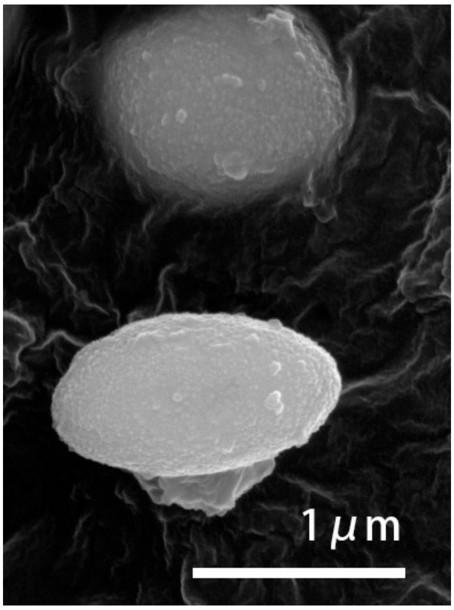

Fig. S4. SEM images of 30%TiO_2/MIL-100(Fe) after 4 cycles

After 4 cycles of experiments, the 30%TiO_2/MIL-100(Fe) composite maintained a basic egg-like morphology, indicating that the photocatalytic degradation of MB did not change the morphology of the TiO_2/MIL-100(Fe) composite.

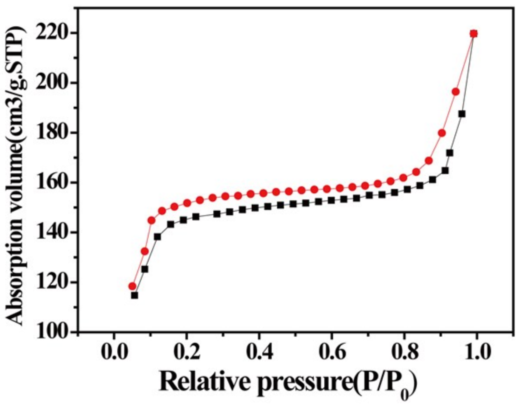

Fig. S5. N_2 adsorption-desorption isotherms of 30%TiO_2/MIL-100(Fe) composite after 4 cycles

After 4 cycles of experiments, there was no significant change in the specific surface area and pore size of the TiO_2/MIL-100(Fe) composite(Fig. S5).