Electronic Supplementary Information (ESI) for

A high efficiency microfluidic-based photocatalytic microreactor using electrospun nanofibrous TiO_2 as photocatalyst

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Preparation of TiO_2 precursor colloid

The ethanol and acetic acid with the volume ratio of 4:1 was mixed completely, and then the tetrabutyl titanate was dissolved in the mixture with the volume ratio of 1:5. When the solution was clear, the polyvinyl pyrrolidone (PVP, *Mw* 1,300,000) was added into the solution at the final concentration of 80 $\mu g \cdot ml^{-1}$under stirring at room temperature.

Electrospinning of TiO_2 nanofibers

A plastic syringe loaded with 1 ml TiO_2 precursor colloid was fastened on the infusion pump and the stainless-steel blunt needle was connected with the high-voltage supply. Under a flow rate of 0.4 $ml \cdot h^{-1}$ and a voltage of 10 kV, the jet was formed from the needle and the TiO_2 precursor nanofibers were collected on the target which was placed 10 cm far from the needle. After collecting for 30 min, the TiO_2 precursor nanofibrous membrane was drying under vacuum for 1 h at room temperature and then heated at 500 ℃ for 2 h to burn out the polymer in the muffle furnace. Finally, the TiO_2 nanofibrous membrane was taken out from the muffle furnace and stored in the dry environment.

Preparation of TiO_2 film

The TiO_2 precursor colloid was spun coated onto a glass slide (25 mm×25 mm) at a rotation rate of 1000 rpm for 30 s, and then the glass slide was removed into the muffle furnace for calcination (500 ℃, 2 h).

Characterization

The morphologies and phase of TiO_2 nanofibers and TiO_2 film were characterized by scanning electron microscopy (SEM, TM3000) and X-ray diffraction (XRD; X'pert Pro-1), respectively. The surface area of nanofibrous TiO_2 was determined by nitrogen adsorption/desorption using the Brunauer–Emmett–Teller method (BET, QuadraSorb SI4)

Manufacture of fiber and film microreactor

The PDMS substrate with microchannel was fabricated by soft lithography. In brief, firstly the glass substrate was treated by a piranha wet etch (H_2SO_4: H_2O_2 v:v= 3:1) followed by a de-ionized water clean and subsequently dehydration (180 ℃, 2 h). Secondly the glass substrate was spun coated by SU-8 photoresist (600 rpm, 30 s followed by 1000 rpm, 30 s), and through a series of established procedure including soft bake, exposure under UV light with designed masker, post exposure bake, removal and hard bake. Thirdly the PDMS substrate was formed by pouring prepolymer (10:1) into the SU-8 template and cured at 80 ℃ for 1 h.

The manufacture process included three steps: (1) Tailoring electrospun nanofibrous TiO_2 to suitable shape and pasting it on the glass piece with dilute PDMS (PDMS: methylbenzene *v:v*= 2:3). (2) Sealing the PDMS substrate on this glass piece with dilute PDMS and to make sure the

area of microchannel all covered by nanofibrous TiO_2. (3) Drying the fiber microreactor in vacuum for 1 h followed by heating for 30 min at 80 ℃.

The film microreactor fabrication was by directly gluing the PDMS substrate on the TiO_2 coated glass followed by drying and heating that was the same as the third step of fiber microreactor manufacture.

Photodegradation experiment

The Methylene blue solution (10 $mg \cdot l^{-1}$) was injected into the fiber or film microreactor with syringe pump and the UV irradiation was supported by UV-LED (365 nm, 50 $mW \cdot cm^{-2}$). The degraded MB solution of each cycle (2 ml) was analyzed by UV-visible spectrophotometer (664 nm).

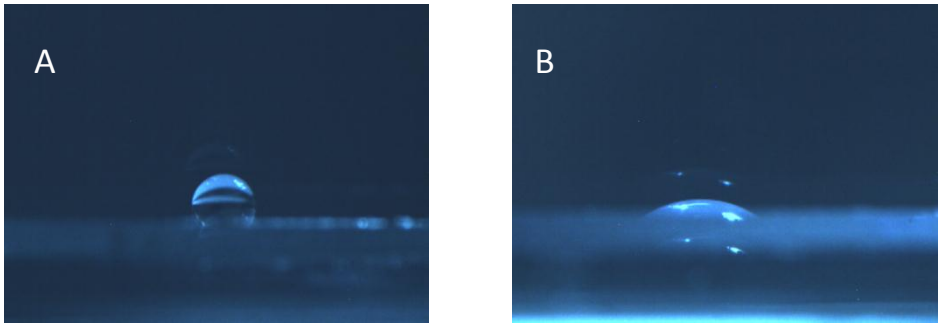

Fig.S1 Water contact angle on electrospun nanofibrous TiO_2 (A) and TiO_2 film (B)