Electronic Supplementary Material (ESI) for Nanoscale.
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Electronic Supplementary Information (ESI)

In situ dual-functional water purification with simultaneous oil removal and visible light catalysis

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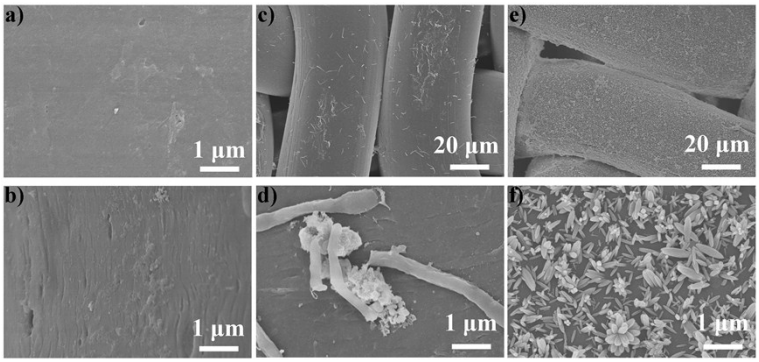

Fig. S1 FESEM images of nylon mesh before and after treated with PDA followed by anchored with β-FeOOH nanostructures: (a) the nascent nylon mesh with a smooth surface, (b) the PDA pretreated mesh showing rough surface with numerous nanostructured ravines and papillaes, (c, d) the β-FeOOH anchored mesh at hydrolysis temperature of 40 ^{o}C with different magnifications, (e, f) the β-FeOOH anchored mesh at hydrolysis temperature of 60 ^{o}C with different magnifications.

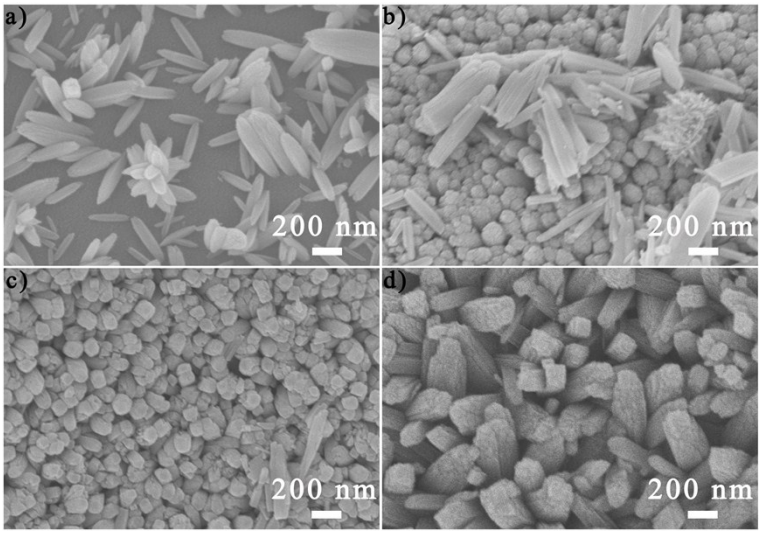

Fig. S2 FESEM images of β-FeOOH anchored meshes synthesized at different hydrolysis temperatures with larger magnifications: (a) 60 ^{o}C, (b) 80 ^{o}C, (c) 90 ^{o}C, (d) 100 ^{o}C, respectively.

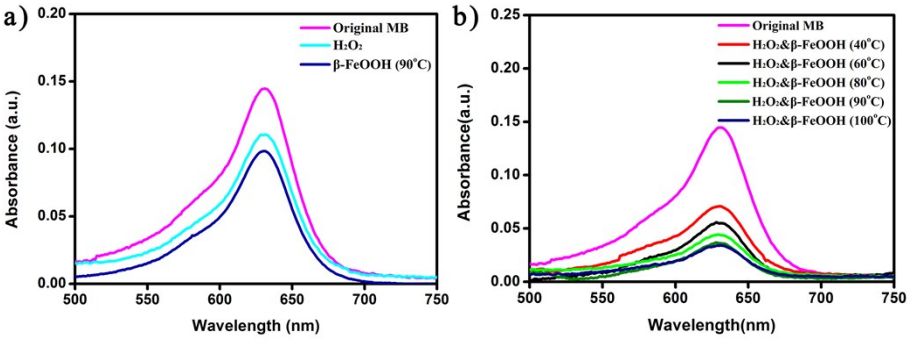

Fig. S3 (a, b) UV-Vis adsorption spectra of the dye solutions under different conditions over 30 min of visible light irradiation, respectively.

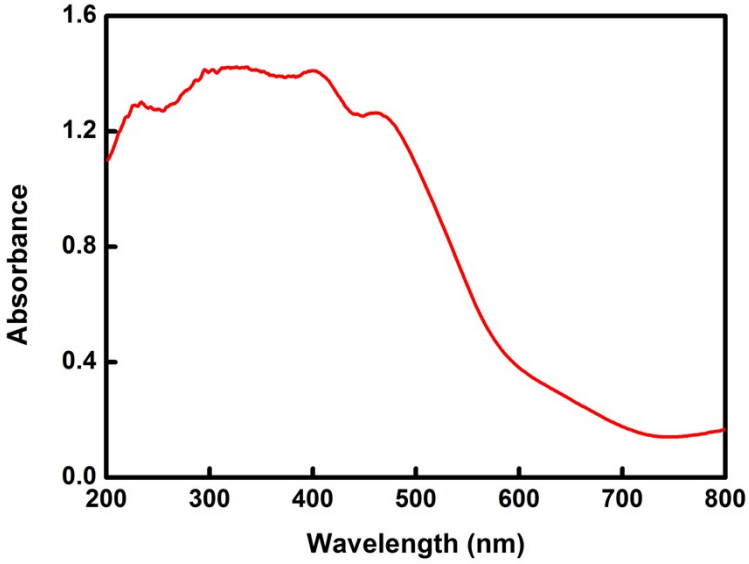

Fig. S4 UV-Vis diffused reflection spectra of β-FeOOH nanorods.

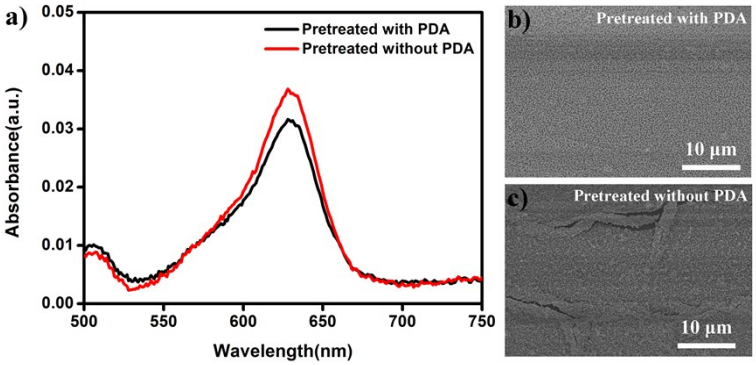

Fig. S5 The effect of PDA on immobilization and corresponding photocatalytic performance: (a) UV-Vis adsorption spectra of MB solutions within β-FeOOH deposited on PDA pretreated/un-pretreated meshes over 30 min of visible light irradiation, respectively, (b, c) FESEM images of β-FeOOH deposited on PDA pretreated/un-pretreated meshes.

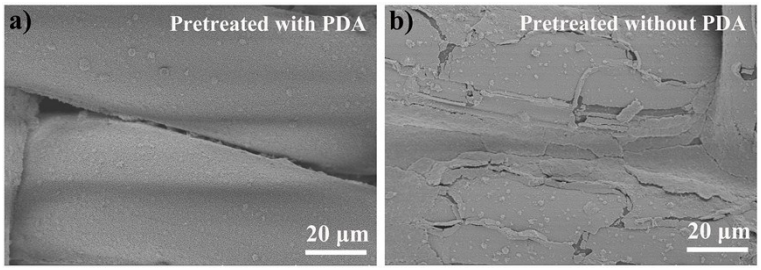

Fig. S6 FESEM images of β-FeOOH deposited on PDA pretreated/un-pretreated meshes after one time processing of oil removal, respectively.

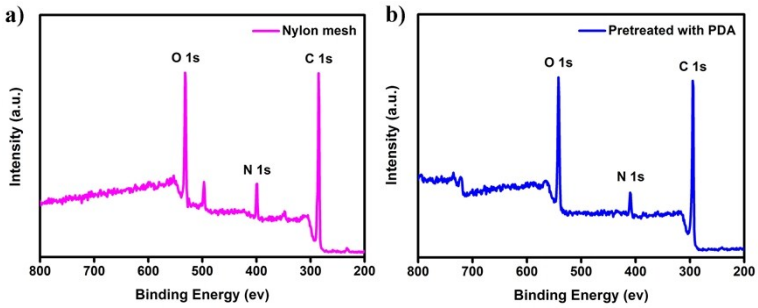

Fig. S7 XPS survey spectra of the nascent nylon mesh (a) and PDA pretreated mesh (b).

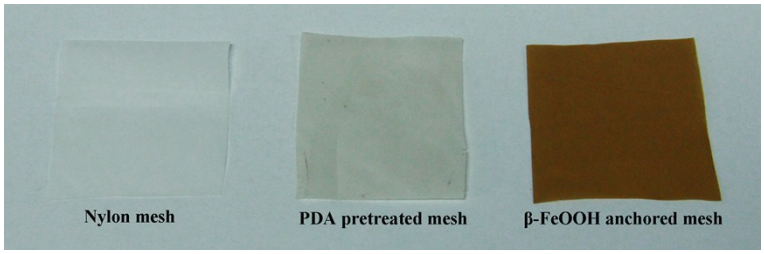

Fig. S8 Color variation of the substrate before and after treated with PDA followed by hydrolysis reaction.

Table S1 Atomic percentage of element compositions of the nylon mesh before and after pretreated with PDA

Samples	C 1s	N 1s	O 1s
Nylon mesh	69.54	7.34	23.12
Pretreated with PDA	68.63	5.82	25.55

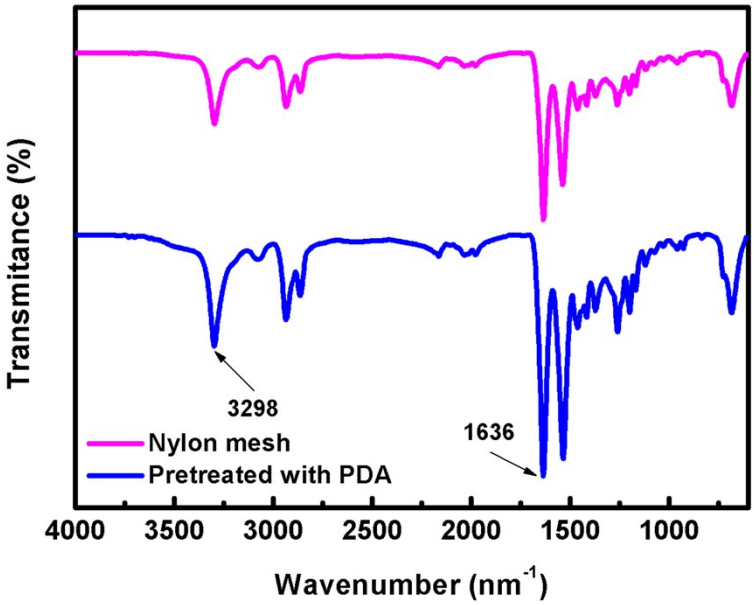

Fig. S9 FTIR spectra of the nylon mesh before and after pretreated with PDA.

Video S1 The separation process of β-FeOOH anchored mesh towards toluene/water mixtures contaminated with MB dye. Water selectively permeated through the mesh, while oil was blocked in the upper glass tube.

Fig. S10 Separation result of the nascent nylon mesh towards toluene/water mixtures contaminated with MB dye, in which the mixtures permeated through the mesh altogether.

Fig. S11 The Xenon arc lamp apparatus used in this work.

Table S2 Comparison of this approach with other supported or unsupported β-FeOOH nanomaterials

Materials	Methods	Configuration	Catalyst concentration (mg/L)	Photocatalytic activity	TON (h^{-1})	Function	References
β-FeOOH	Ultrasound-microwave assisted	Unsupported	400	89 % after 120 min irradiation	0.024	Catalyst	36
β-FeOOH	Hydrothermal	Unsupported	200	Complete degradation after 80 min irradiation	0.041	Catalyst	44
TiO_2/β-FeOOH	Deposition-precipication	Unsupported	200	86.3 % after 120 min irradiation	0.023	Catalyst	45
β-FeOOH/TiO_2	Maleic acid as organic binder	Unsupported	200	99 % after 45 min irradiation	0.032	Catalyst	46
β-FeOOH	Hydrothermal	Supported by PP nonwoven	680	Complete degradation after 60 min irradiation	0.0033	Catalyst	34
β-FeOOH	Hydrothermal	Supported by nylon mesh	90	92 % after 40 min irradiation	0.0085	Catalyst & oil removal	This approach

Fig. S12 Photograph of the collected sample that the β-FeOOH anchored meshes after one time *in situ* dual-functional water purification test were immersed in an alkaline solution (pH ~ 12) for 2 h, showing extremely transparent color.