# Supporting Information

# Peroxidase and UV-Triggered Oxidase Mimetic Activities of UiO-66-$NH_2$/Chitosan Composite Membrane for Antibacterial Property

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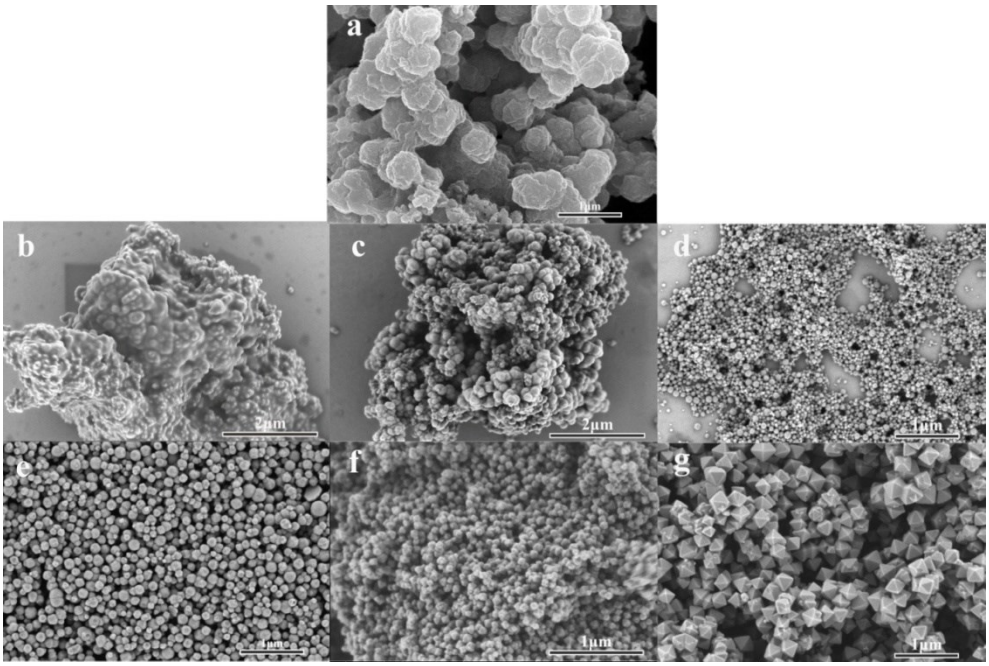


**Figure S1.** SEM image of UiO-66-$NH_2$ nanoparticles with the varied equivalent ratio of PABA to $H_2ATA$, a) 0, b) 10, c) 30, d) 50, e) 75, f) 100, and g) 150.

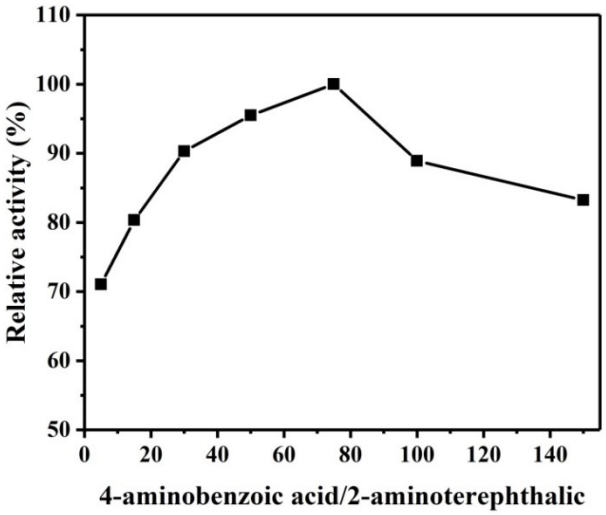


**Figure S2.** Catalytic oxidation of peroxidase substrate TMB·2HCl by $H_2O_2$ with different equivalent ratios of PABA to $H_2ATA$.

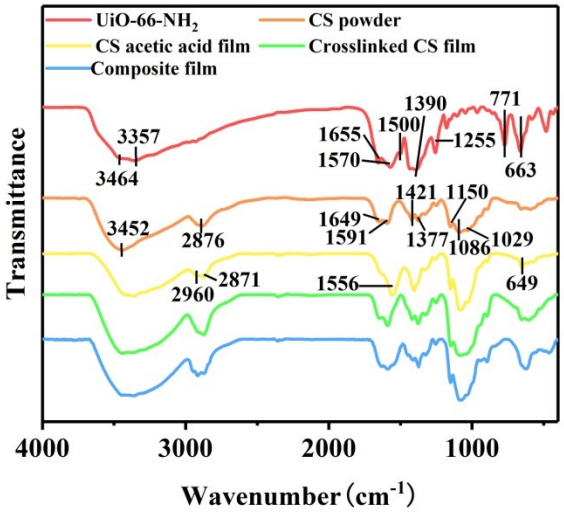


**Figure S3.** FTIR spectra of UiO-66-$NH_2$, CS powder, CS acetic acid film, $Na_2SO_4$ crosslinked CS film, and UiO-66-$NH_2$/CS composite film.

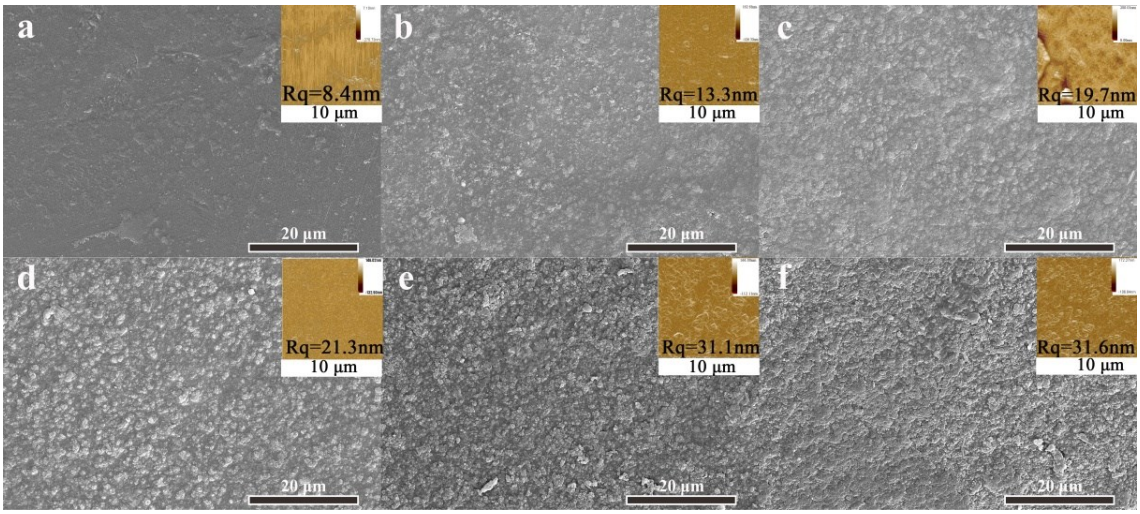


**Figure S4.** SEM (×3000) and AFM images of the surface morphology of the UiO-66-$NH_2$/CS composite membrane with the weight ratio of UiO-66-$NH_2$ to CS, a) 0:10, b) 1:10, c) 3:10, d) 5:10, e) 7:10, and f) 9:10.

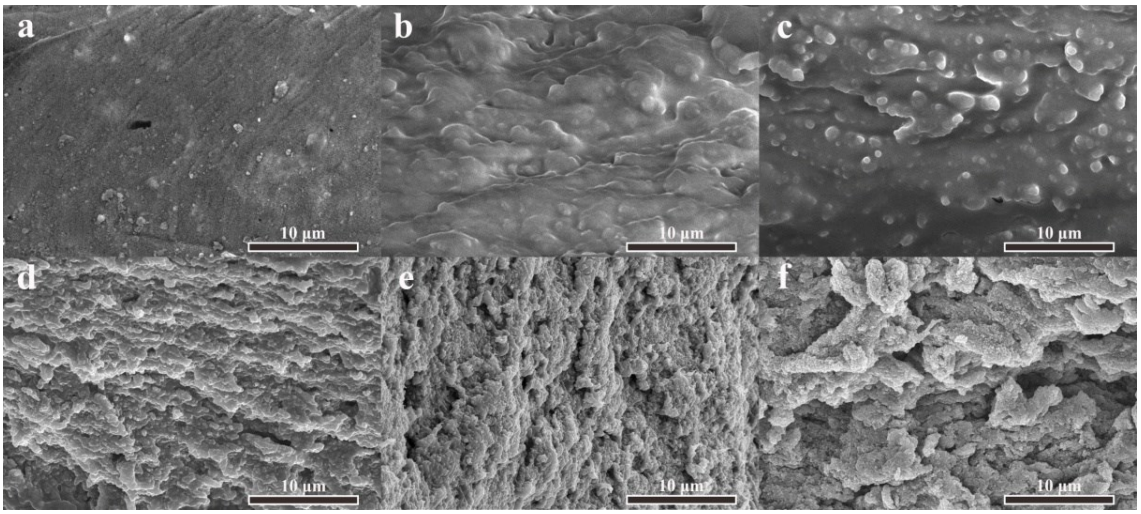


**Figure S5.** The cross-section SEM (×6000) images of the UiO-66-$NH_2$/CS composite membrane with the weight ratio of UiO-66-$NH_2$ to CS, a) 0:10; b) 1:10, c) 3:10, d) 5:10, e) 7:10 and f) 9:10.

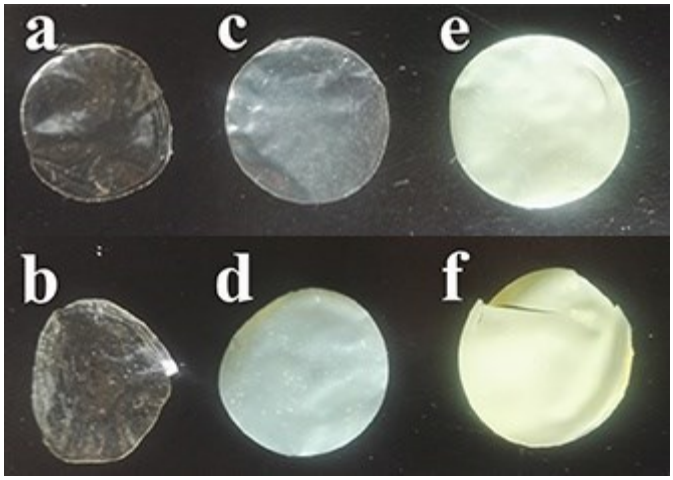


**Figure S6.** Photographs of the UiO-66-$NH_2$/CS composite membranes with the varied weight ratios of UiO-66-$NH_2$ NPs to CS, a-b) 0:10, c) 1:10, d) 3:10, e) 6:10, and f) 9:10.

**Peroxidase-like activity measurements**

Acetate buffer solution (0.1 M, pH=4.0, 4 mL), TMB·2HCl (1 mM), $H_2O_2$ (3 wt%, 45 μL) and 0.25 $cm^2$ CS or UiO-66-$NH_2$/CS composite membrane were added and the reaction mixture was incubated at room temperature for 30 min followed by monitoring the formation of oxidation product of TMB·2HCl at 652 nm using UV-vis spectrophotometry.

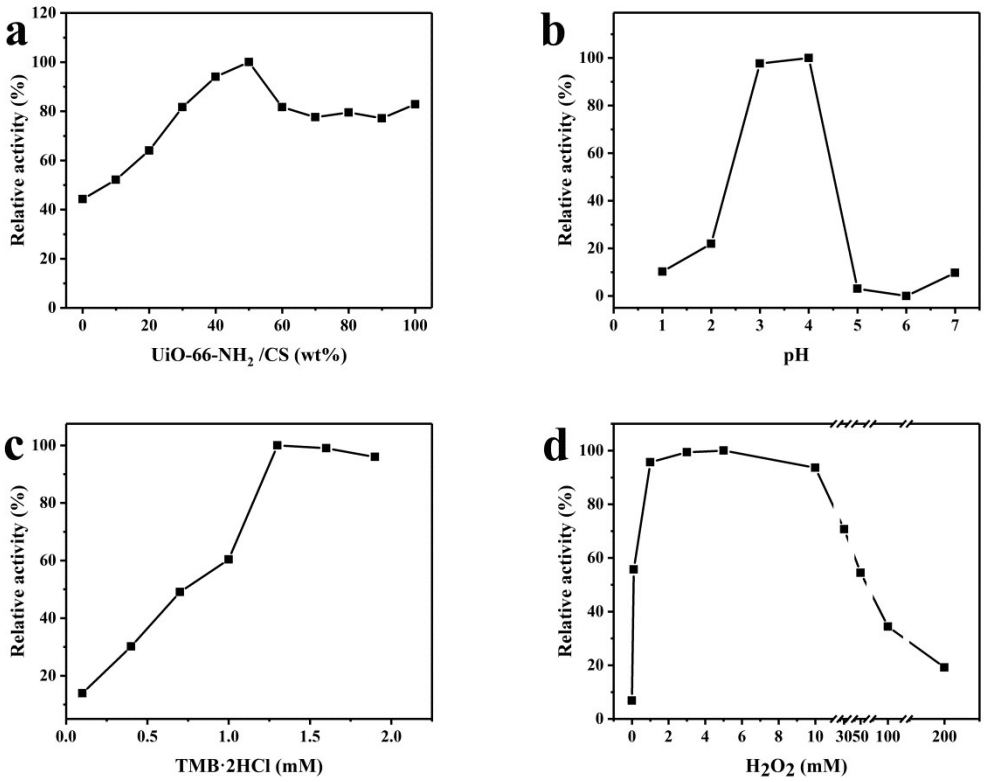


**Figure S7.** The catalytic oxidation of peroxidase substrate TMB·2HCl under different conditions: a) with different weight ratios of UiO-66-$NH_2$ to CS, b) under different pH conditions, c) with various TMB·2HCl amounts, and d) with various $H_2O_2$ amounts.

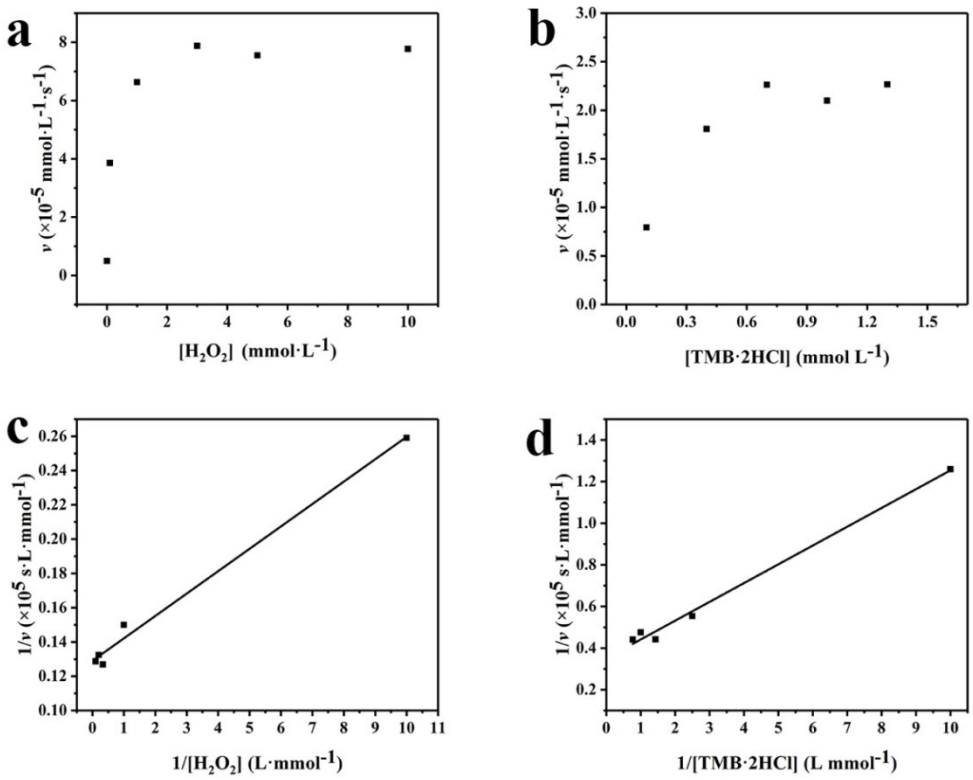


**Figure S8.** The kinetics of the reaction was measured using the UiO-66-$NH_2$/CS composite membrane (r=0.25 cm) and TMB·2HCl (1.3 mM) under different (a) $H_2O_2$, and (b) TMB·2HCl concentrations. Corresponding double-reciprocal plots of peroxidase-like activity of the UiO-66-$NH_2$/CS composite membrane at a fixed concentration of one substrate versus varying concentration of another substrate for (c) $H_2O_2$ or (d) TMB·2HCl.

**Table S1.** The Michaelis-Menten ($K_m$) constant and maximum reaction rate ($V_{max}$) of theUiO-66-$NH_2$/CS composite membrane.

| Catalyst | $K_m$ (mM) | | $V_{max}$ ($10^{-8}$ M $s^{-1}$) | |
|---|---|---|---|---|
| | TMB·2HCl | $H_2O_2$ | TMB·2HCl | $H_2O_2$ |
| UiO-66-$NH_2$/CS composite membrane | 0.10 | 0.26 | 7.75 | 2.85 |
| HRP[1] | 0.17 | 10.9 | 41.8 | 58.5 |
| GO-$Fe_3O$[2] | 0.43 | 0.71 | 13.08 | 5.31 |
| Cu-Ag/rGO[3] | 0.63 | 8.63 | 4.26 | 7.02 |
| Hemin@MOF[4] | 10.9 | 0.07 | 8.98 | 6.07 |
| MOF-808[5] | 0.08 | 1.06 | 3.12 | 1.39 |

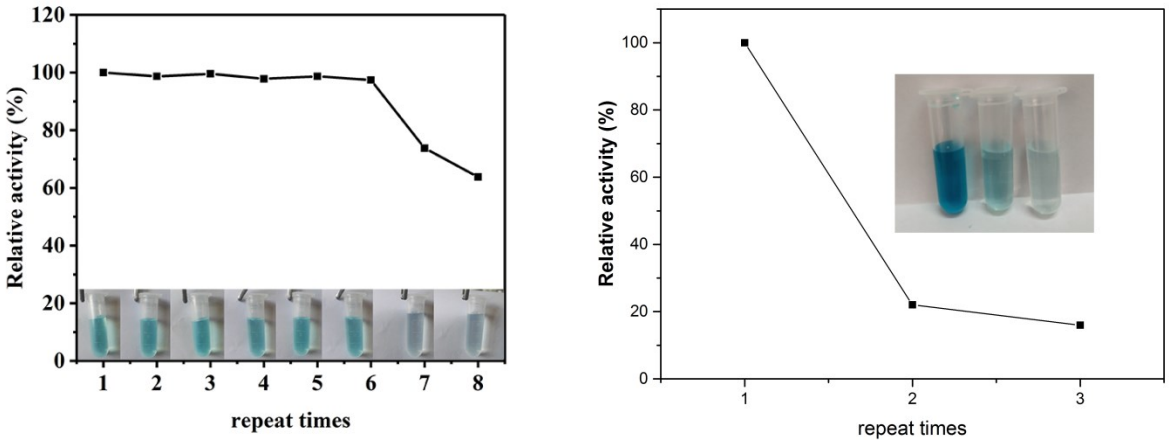


**Figure S9. a)** Photocatalytic stability of UiO-66-$NH_2$/CS (50%) composite membrane by 8 cycles of tests; b) Catalytic cycles of UiO-66-$NH_2$/CS (50%) composite membrane in the presence of $H_2O_2$ at neutral pH. The result showed that the peroxidase-like catalytic activity of UiO-66-$NH_2$/chitosan composite membrane obviously decreased.

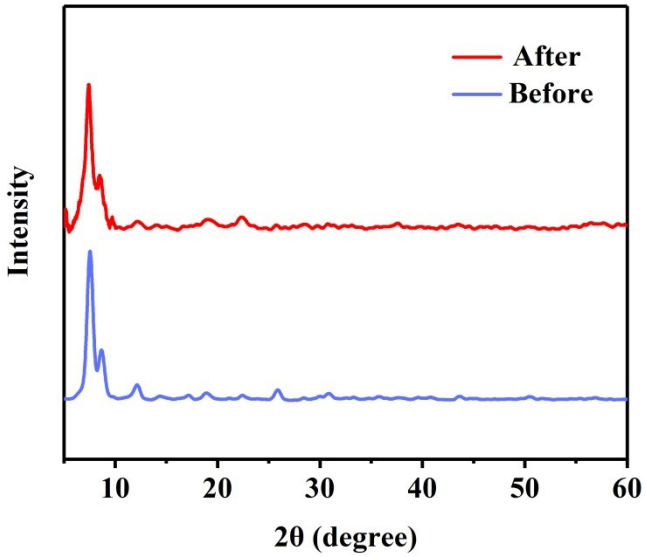


**Figure S10.** Powder XRD profiles for the UiO-66-$NH_2$/CS composite membrane before and after photo catalysis.

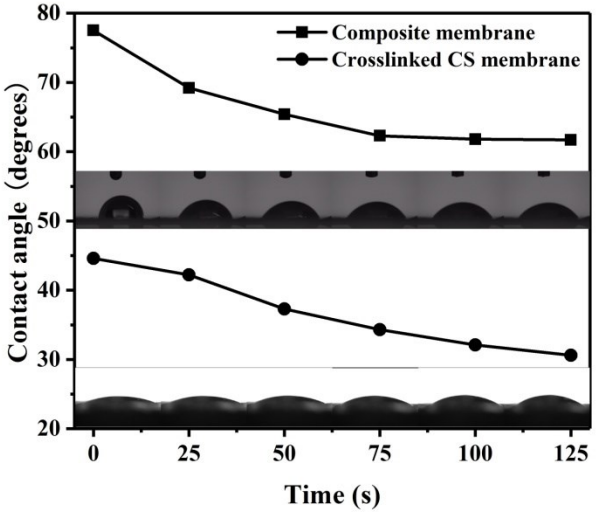


**Figure S11.** Dynamic contact angles of the crosslinked CS membrane and theUiO-66-$NH_2$/CS composite membrane.

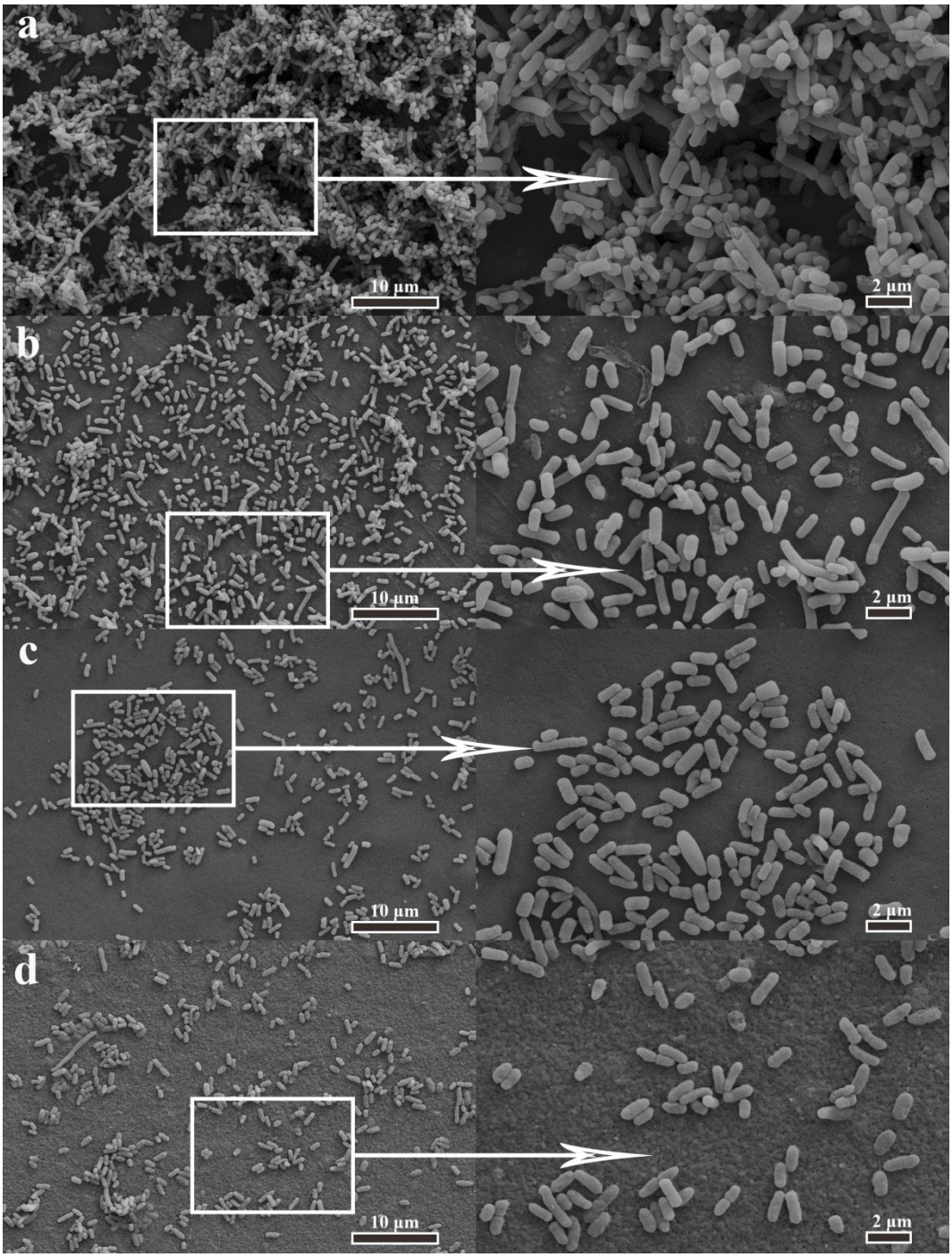


**Figure S12.** The morphology of *E. coli* in solid circumstance: a) CS membrane+PBS, b) CS membrane+$H_2O_2$, c) UiO-66-$NH_2$/CS composite membrane+PBS, and d) UiO-66-$NH_2$/CS composite membrane+$H_2O_2$, with UV irradiation of the UiO-66-$NH_2$/CS composite membrane for 30 min.

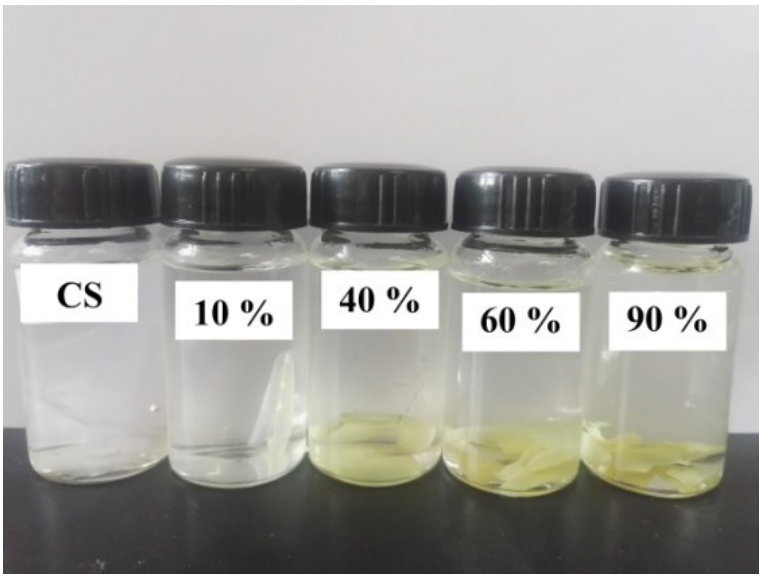


**Figure S13.** Photographs of the UiO-66-$NH_2$/CS composite membrane with different weight ratios of UiO-66-$NH_2$ to CS after immersion into water for 30 days followed by ultrasonication for 2 h.

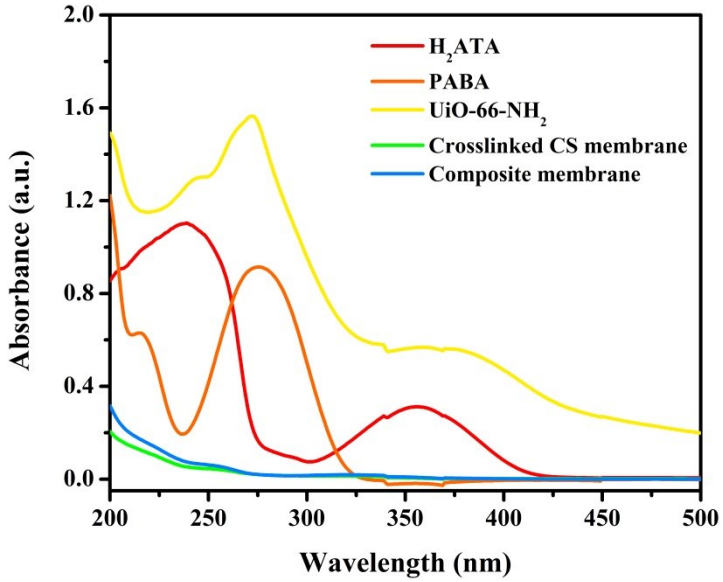


**Figure S14.** The UV-vis absorbance of the liquid taken from the vials with two pieces of membranes (1.5 cm × 2.5 cm) in 20 mL of water.

**Figure S15** Peroxidase-like enzymatic activity of UiO-66-$NH_2$/chitosan composite membrane stored for two years. The long term stability for peroxidase mimicking was detected in the presence of TMB•2HCl and $H_2O_2$. The reaction solution quickly turned blue, which indicated that its peroxidase-like enzymatic activity was maintained well.

**References**


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[4] Qin, FX, Jia, SY, Wang, FF, Wu, SH, Song, J, Liu, Y. Hemin@metal-organic framework with peroxidase-like activity and its application to glucose detection. Catal. Sci. Technol. 2013, 3: 2761-2768

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