

Supporting Materials

Boosting photocatalytic H₂O₂ production in pure water over plasmonic photocatalyst with polyethylenimine modification

*Xiangming Li^a, Junjia Zhu^a, Bo Sun^a, Qi Yuan^a, Haitao Li^b, Zequn Ma^{*c}, Tiwen Xu^{*a}, Xingyuan Chen^d, Meng Fu^{*a}*

^aSchool of Materials Sciences and Technology, Guangdong University of Petrochemical Technology, Maoming, 525000, China.

^bSchool of Chemistry and Chemical Engineering, Yangzhou University, Yangzhou, 225002, China.

^cInstitute of Materials Science and Devices, School of Materials Science and Engineering, Suzhou University of Science and Technology, Suzhou, 215009, China.

^dDepartment of Physics, School of Science, Guangdong University of Petrochemical Technology, Maoming, 525000, China.

E-mail: fm@gdupt.edu.cn, twxu2017@gmail.com, mazequn@usts.edu.cn

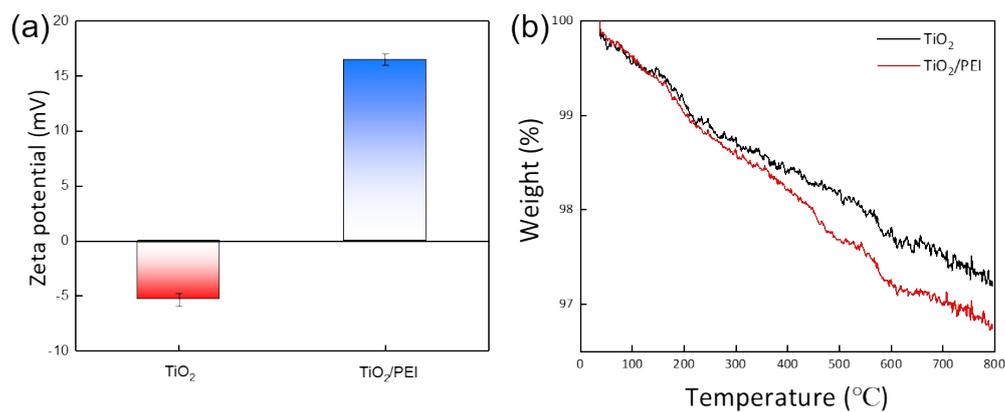


Figure S1. (a) Zeta potential and (b) TGA curves of TiO₂ and TiO₂/PEI.

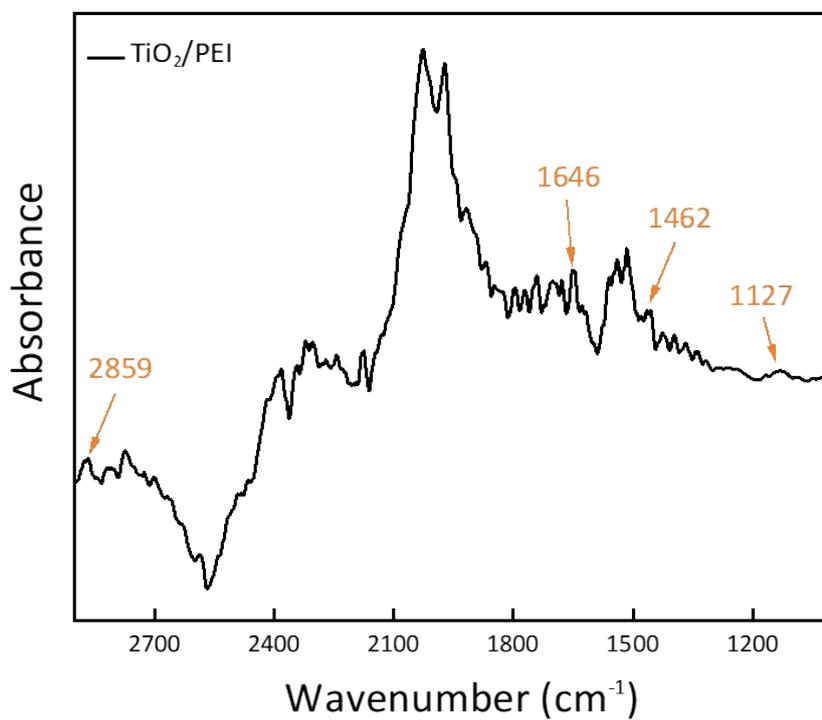


Figure S2. ATR-FTIR spectra of TiO₂/PEI.

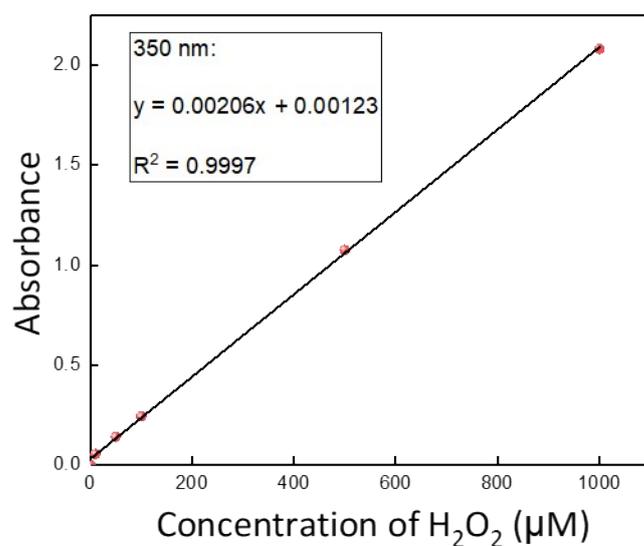


Figure S3. The calibration curve for different H₂O₂ concentrations used in this paper.

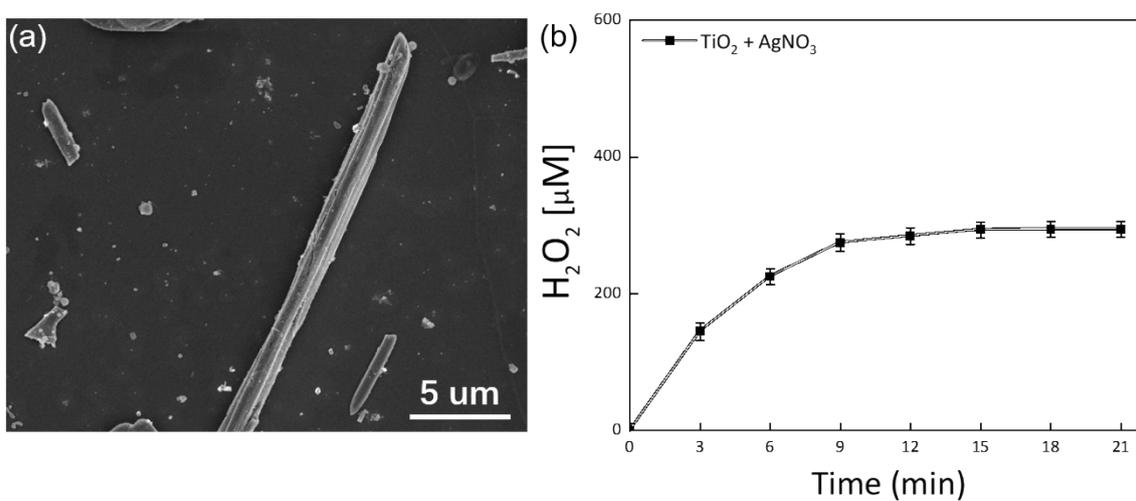


Figure S4. (a) SEM image of the TiO₂/Ag and (b) Time course for H₂O₂ production with TiO₂/Ag as photocatalyst in pure water under sun light.

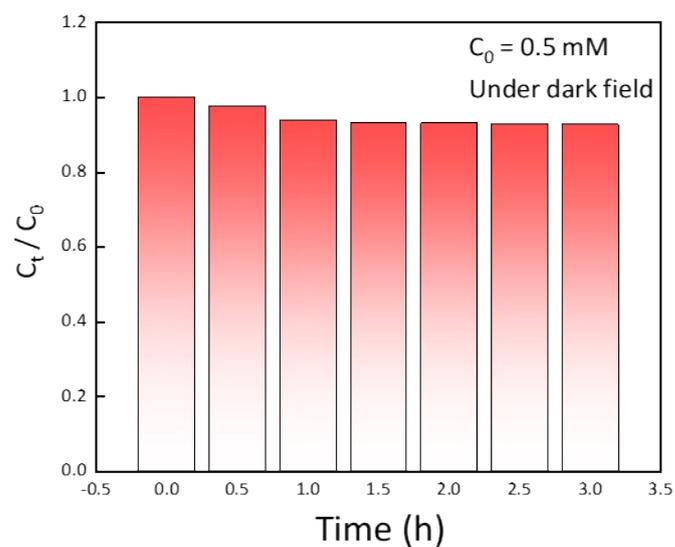


Figure S5. Decomposition of H₂O₂ by TiO₂/PEI/AgNP under dark field, the concentration of H₂O₂ is 0.5 mM.

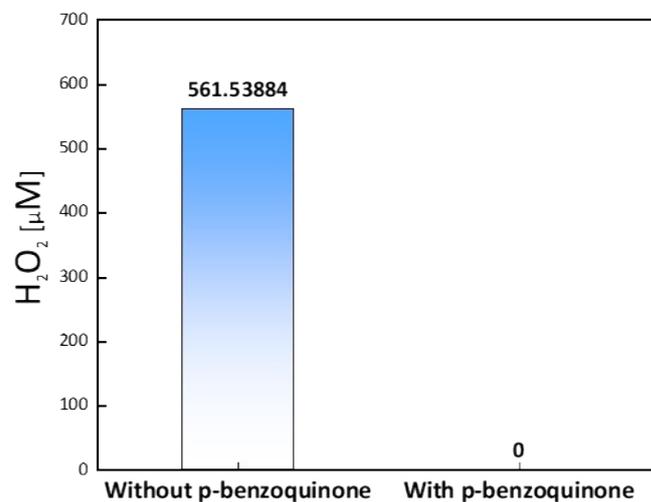


Figure S6. Photocatalytic H₂O₂ production of TiO₂/PEI/AgNP with or without ·O₂⁻ scavenger p-benzoquinone (0.5 mM) under sun light.

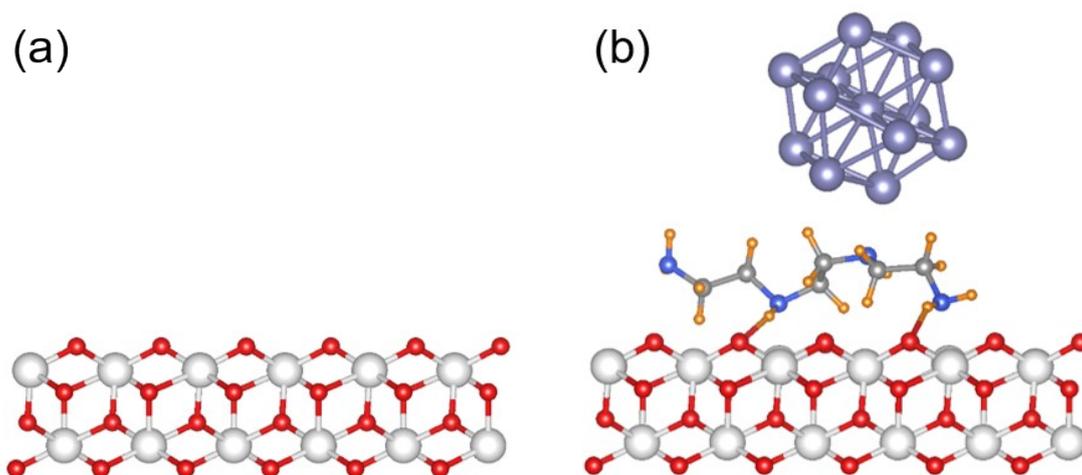


Figure S7. DFT calculations. Optimized structures of (a) TiO_2 and (b) $\text{TiO}_2/\text{PEI}/\text{AgNP}$, respectively. C, N, H, O, Ti, and Ag atoms represented as grey, blue, orange, red, white and purple spheres, respectively.

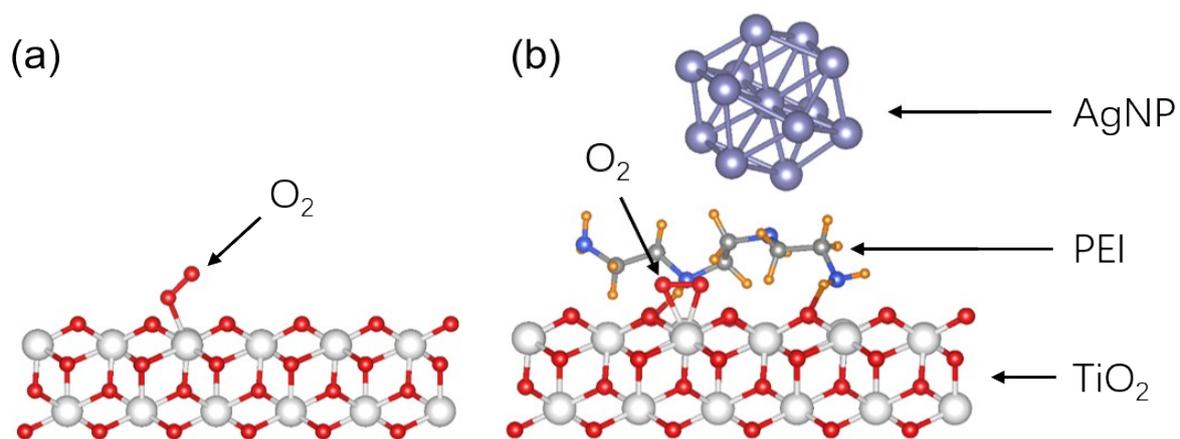


Figure S8. DFT calculations. Optimized structures for the O_2 molecule adsorbed on (a) TiO_2 , and (b) $\text{TiO}_2/\text{PEI}/\text{AgNP}$, respectively. C, N, H, O, Ti, and Ag atoms represented as grey, blue, orange, red, white and purple spheres, respectively.

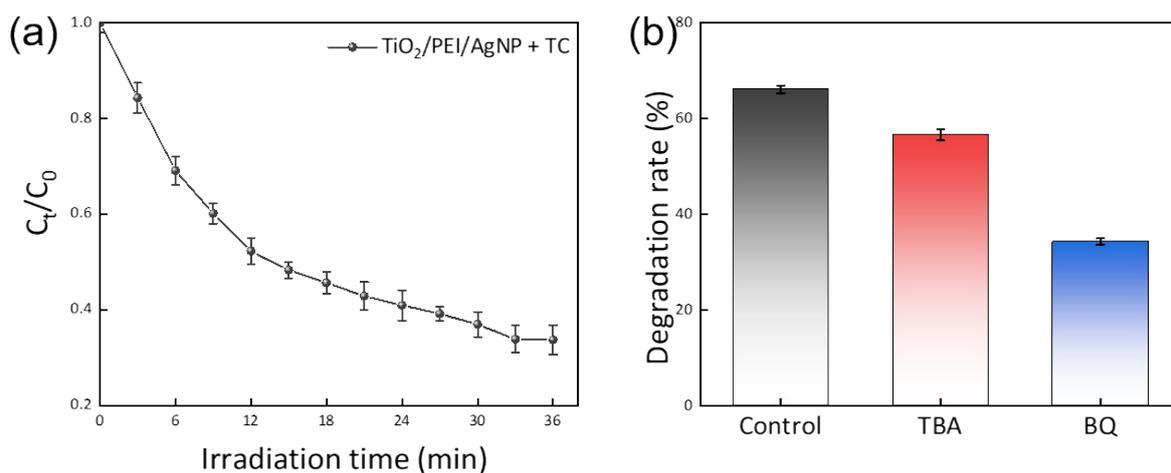


Figure S9. (a) Degradation dynamics curve of tetracycline (TC) over TiO₂/PEI/AgNP and (b) Degradation of TC by TiO₂/PEI/AgNP in the presence of different scavengers. TC: 20 mg/L, 30 mL. Samples: 6 mg. Light source: sunlight.

Table S1. Comparison of photocatalytic H₂O₂ production in pure water by different catalysts.

Photocatalysts	Catalyst (g·L ⁻¹)	Light source	Reaction solvent	H ₂ O ₂ synthesis rate (μmol·g ⁻¹ ·h ⁻¹)	Ref.
PEI/C ₃ N ₄	1	sun light	O ₂ saturated pure water	208.1	43
In ₂ S ₃ @Ov/In ₂ O ₃	0.75	visible light	O ₂ saturated pure water	275.4	44
ORP/GCN	1	visible light	O ₂ saturated pure water	125	45
RF resin	1.7	visible light	O ₂ saturated pure water	2.4	3
5Cv@g-C ₃ N ₄	1	sun light	O ₂ saturated pure water	219.1	46
PFBT/TiO ₂	1	visible light	O ₂ saturated pure water	55.2	47
TiO₂/PEI/AgNP	1	sun light	pure water	1605	this work