Supplementary Material

Low frequency AC-photocatalysis coupling for high-efficiency removal of organic pollutants in water based on the self-powered triboelectric nanogenerator

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Fig. S1 Self-built test platform of RPDS



Fig. S2 Short circuit current of RF-TENG equipped with different photoelectrodes under different working conditions



Fig. S3 UV absorption spectra of BPA, TC, and MB degraded by photocatalysts and RPDS in the first three cycles. (a), (b) Degradation comparison of BPA by photocatalyst and DPDS. (c), (d) Degradation comparison of TC by photocatalyst and DPDS. (e), (f) Degradation comparison of MB by photocatalyst and DPDS.

Section S3: Determination of BPA content by ultraviolet spectrophotometry

Normally, the UV absorption range of BPA locates at 220-230nm¹, but it cannot be detected in the UV spectrum due to the small amount in water. Different from HPLC method, Fenton-crystal violet-UV spectrophotometry can realize fast quantitative determination. The test principle is that Fenton reagent has strong aggressiveness against BPA²⁻³. BPA preferentially consumes Fenton's reagent when crystal violet and BPA are present in the solution. In this case, the concentration of Fenton's reagent is

controlled to react exactly with BPA. When BPA is degraded catalytically and the concentration is reduced, the excess Fenton's reagent will decompose crystal violet. Finally, the characteristic absorption peak of crystal violet was analyzed by UV spectrophotometry. When a known concentration of BPA is added, the linear relationship between crystal violet and BPA concentration can be established according to the Lambert-Beer law. BPA concentration was calculated by measuring the absorption spectrum of crystal violet. In this work, 2ml of 0.2 mmol/L crystal violet, 0.3ml of 5 mmol/L FeSO₄, 0.3ml of 20 mmol/L H₂O₂, 0.7ml of 5 mmol/L H₂SO₄ and 5ml of test solution containing BPA were firstly added into a volumetric flask. Then, the volumetric flask was filled with deionized water to a constant volume of 20ml, and finally the test can be carried out after reaction at 40 °C for 15min.



Fig. S4 UV absorption spectra of BPA, TC and MB degraded by RPDS within $4 \sim 9$ cycles. (a) Degradation of BPA in the 4th cycle, (b) Degradation of TC in the 5th cycle, (c) Degradation of MB in the 6th cycle, (d) Degradation of BPA in the 7th cycle, (e) Degradation of TC in the 8th cycle, (f) Degradation of MB in the 9th cycle.

References

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