Electronic Supplementary Material (ESI) for Environmental Science: Nano.

A novel route for microplastics mineralization: Visible-light-driven heterogeneous photocatalysis and photothermal Fenton-like reaction

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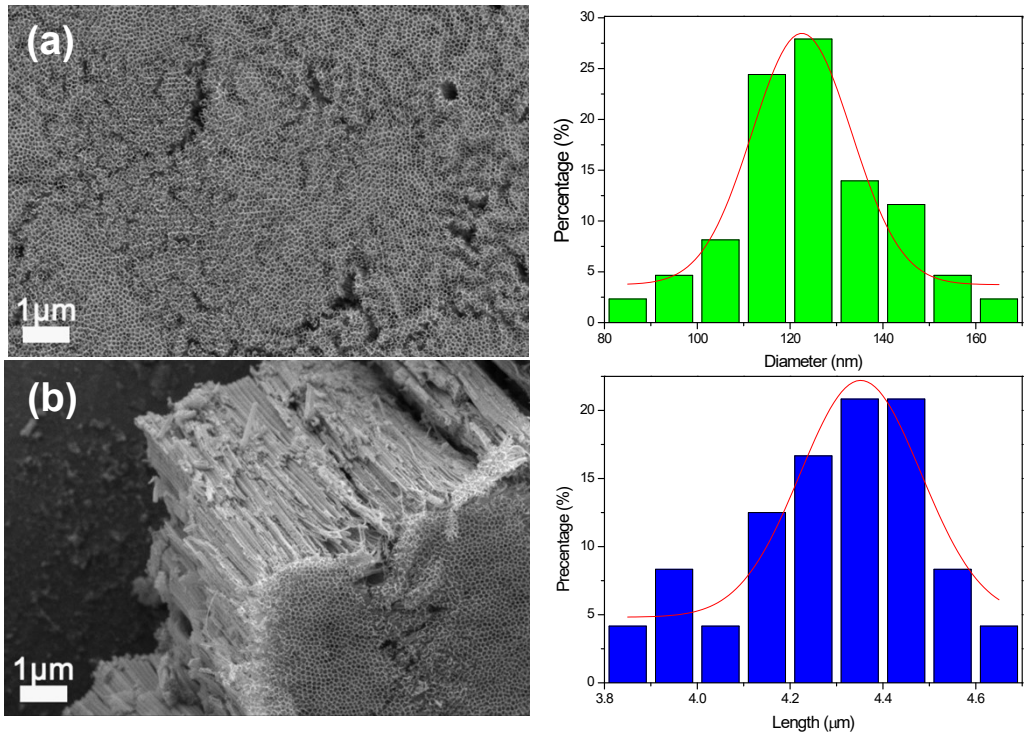

Figure S1. SEM images of TiO_2HNTAs (a) top layer and corresponding pore size distribution (b) cross-section and corresponding length distribution of bottom nanotubes layer.

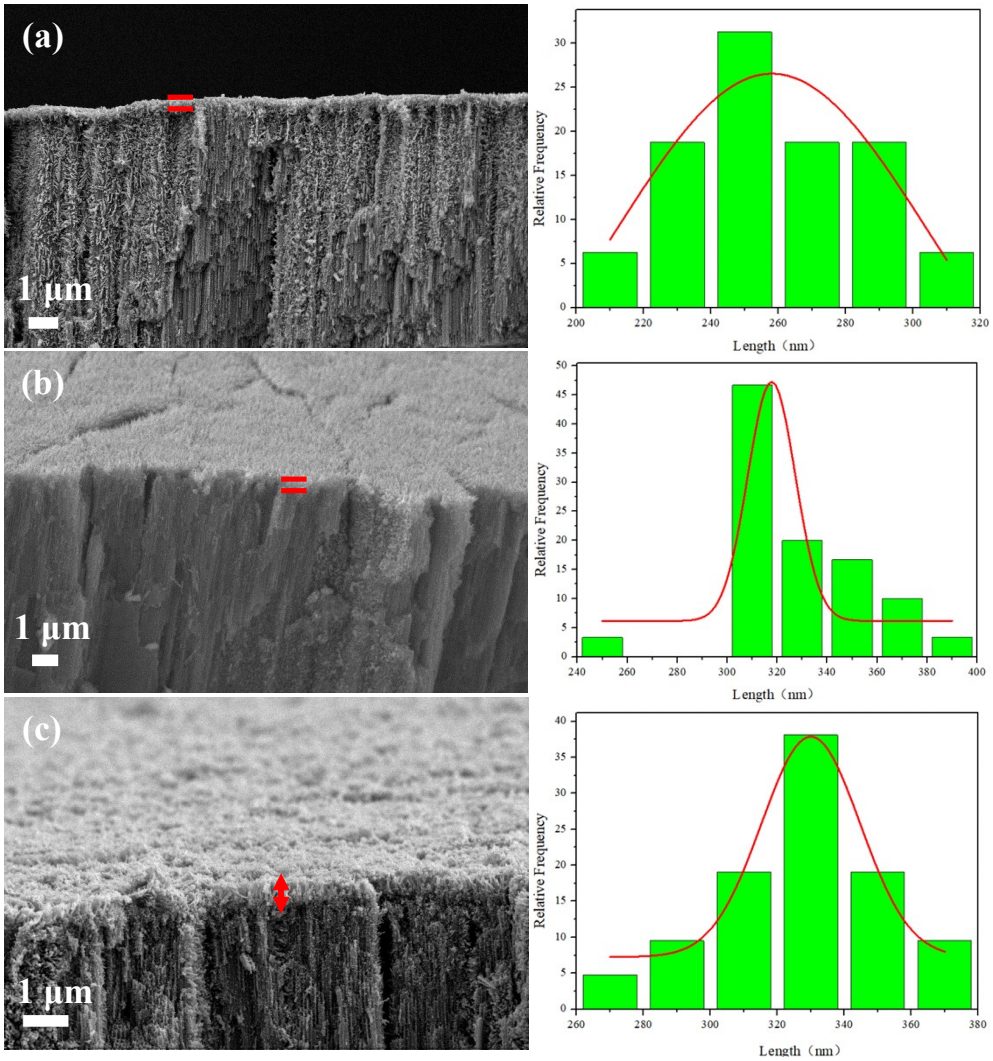

Figure S2. Cross-section of α-Fe_2O_3/TiO_2HNTAs and corresponding thickness (deposited time 1 h, 2 h, 3h).

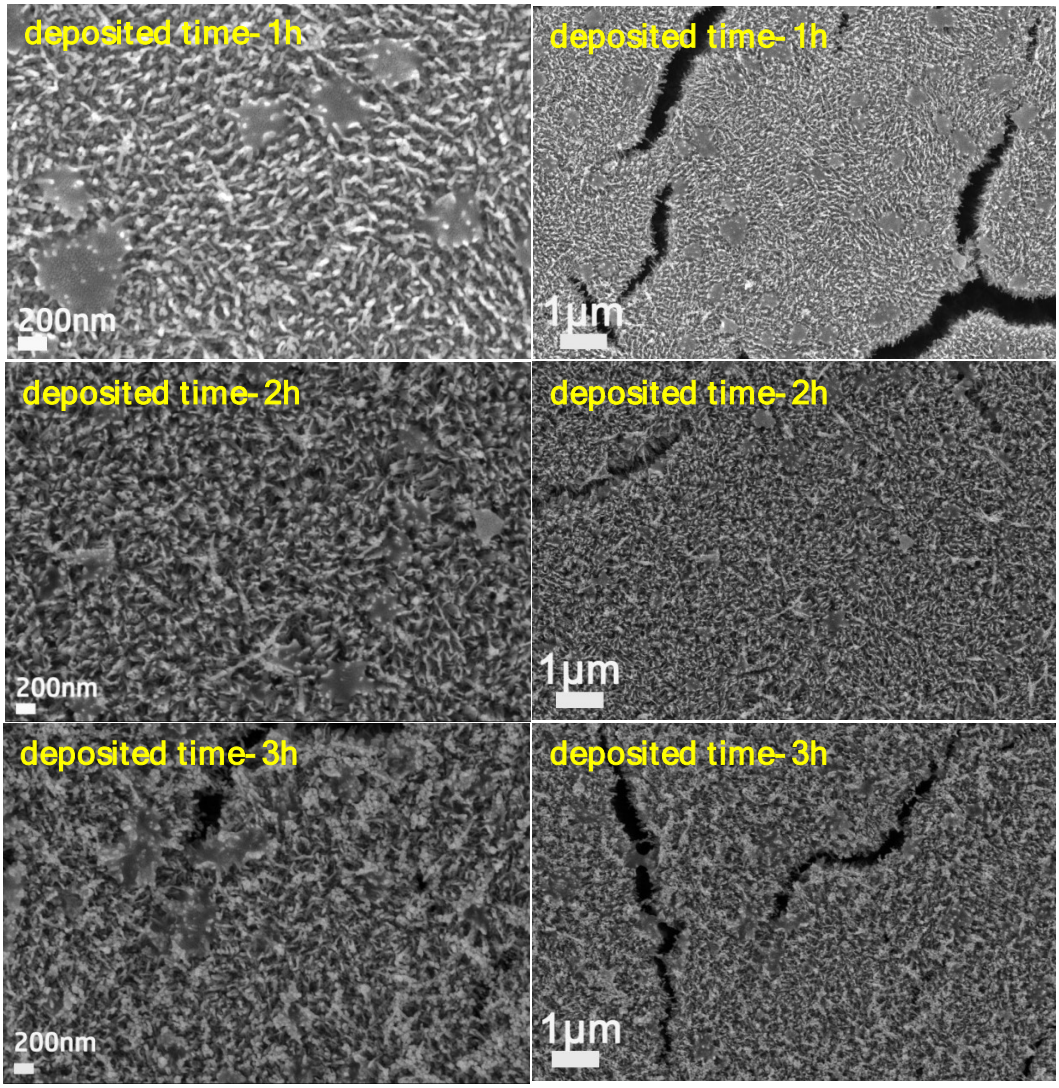

Figure S3. SEM images for the degradation of PS sphere on α-Fe_2O_3/TiO_2HNTAs (deposited time 1 h, 2 h, 3h) under visible-light irradiation for 4 h. 0.5 W/cm^2, 75 °C induced by light irradiation.

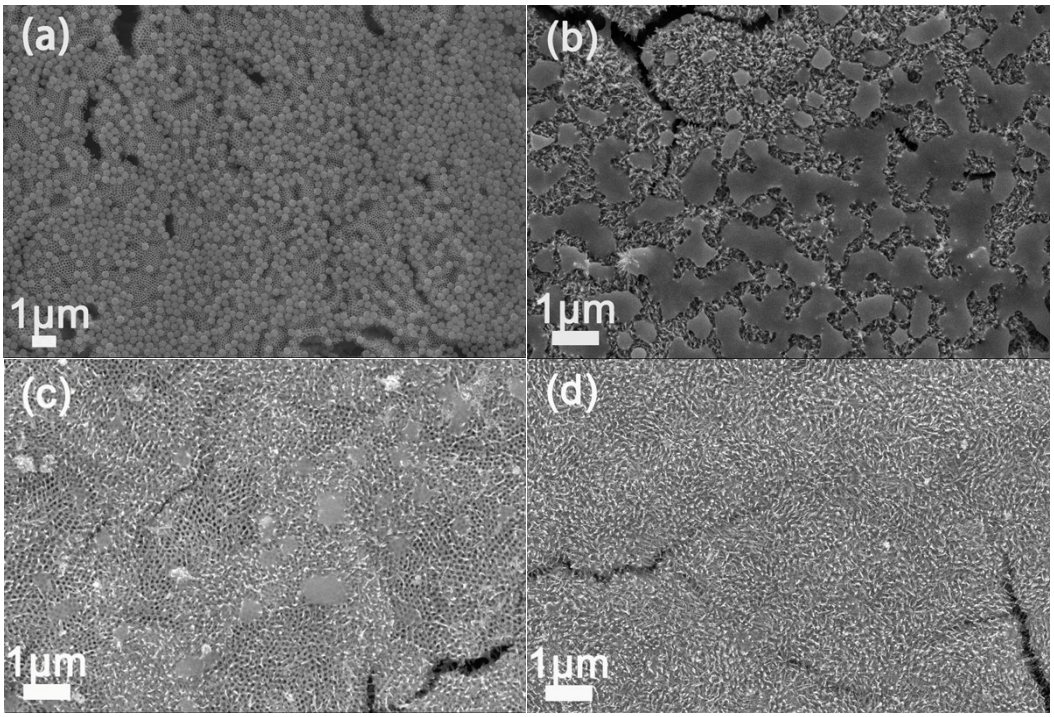

Figure S4. The degradation of PS sphere on TiO_2HNTAs after irradiating for 12 h (a), on α-Fe_2O_3/TiO_2HNTAs after irradiating for 2 h (b), 3 h (c), 4 h (d). The temperature was 75 ^oC induced by visible-light irradiation, 0.5 W/cm^2.

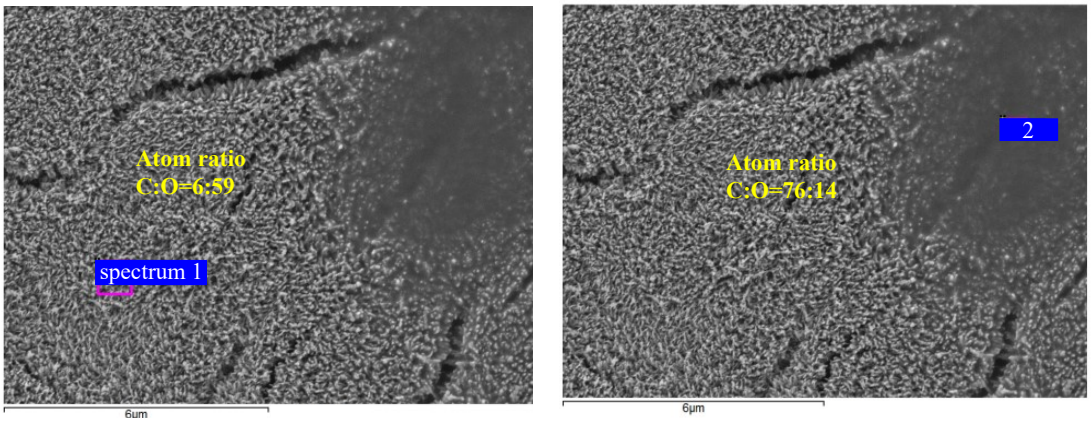

Figure S5. SEM-EDS mapping for α-Fe_2O_3/TiO_2HNTAs and melted PS sphere on its surface due to a synergic mode of photocatalysis and photothermal Fenton-like reaction.

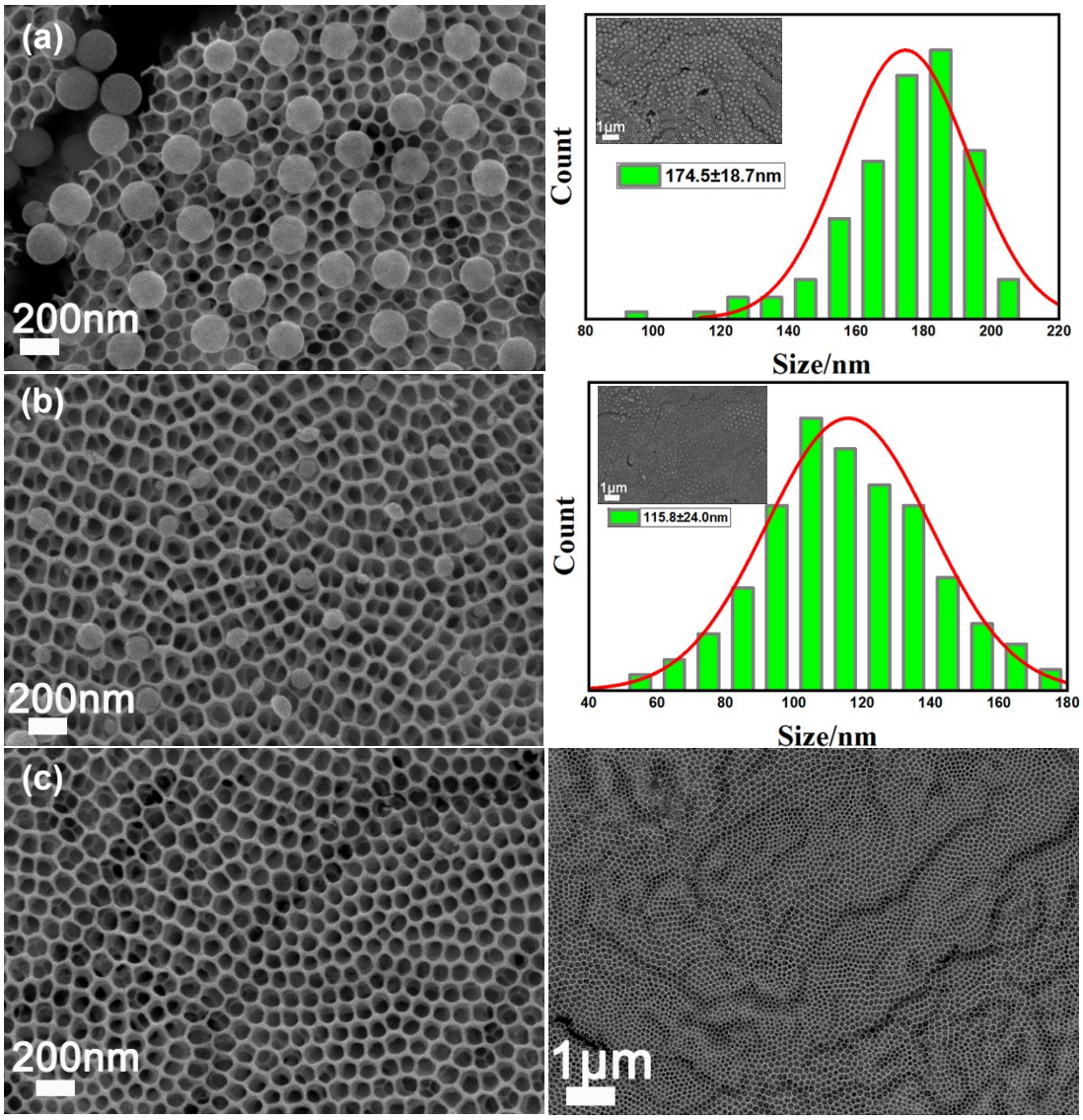

Figure S6. The SEM images and size distribution for PS sphere on TiO_2HNTAs under UV-light irradiation for (a) 6 h, (b) 12 h and (c) 24 h at 60 ^oC.

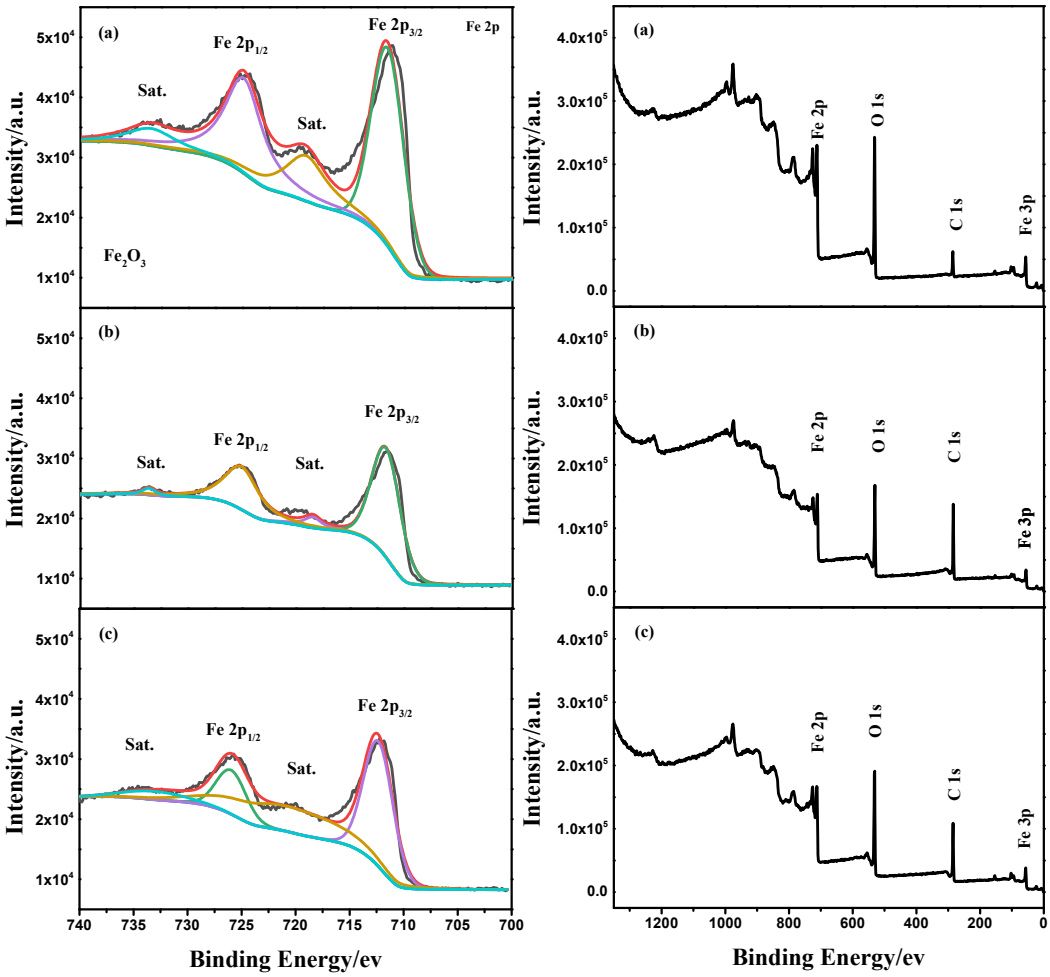

Figure S7. XPS of Fe 2p and full spectrum for (a) α-Fe_2O_3/TiO_2HNTAs, (b-c) PS sphere coated α-Fe_2O_3/TiO_2HNTAs before and after photodegradation. The degradation time is 2 h.

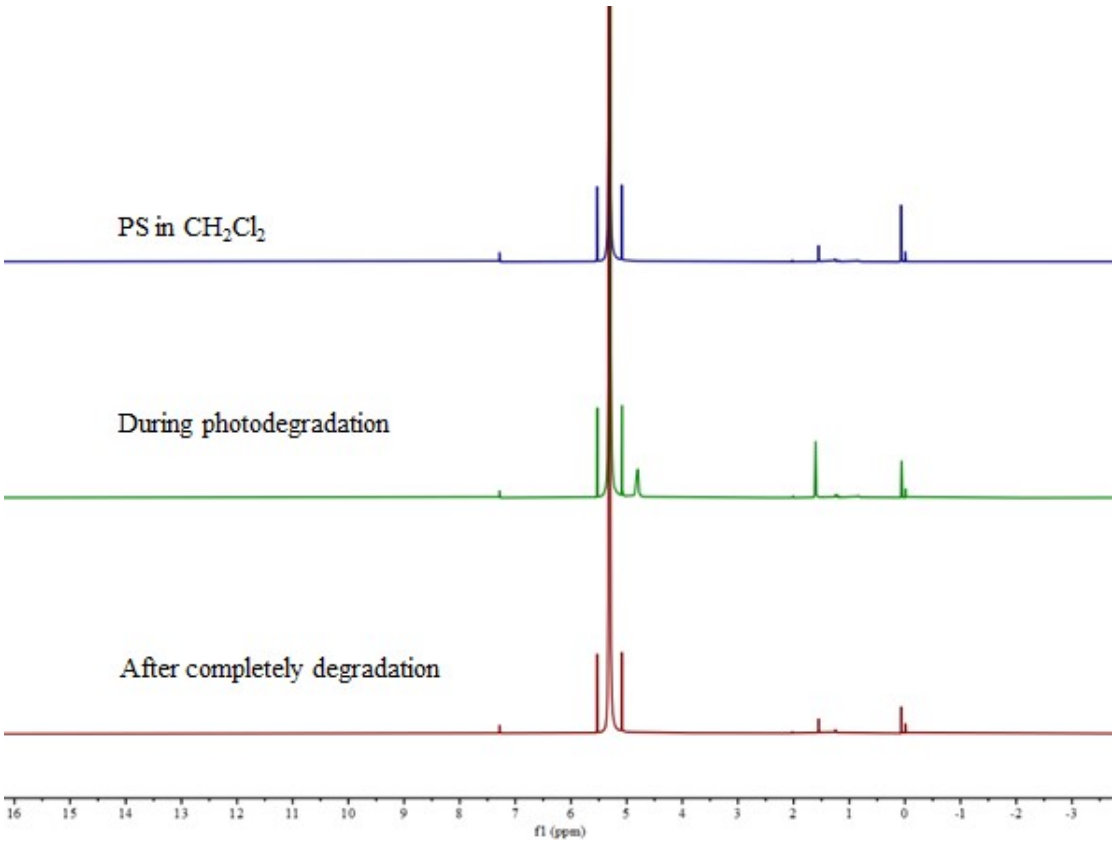

Figure S8. ^{1}H NMR spectra for the PS sphere before, during photodegradation and after completely photodegradation on the catalyst. The test method is provided in experimental section.

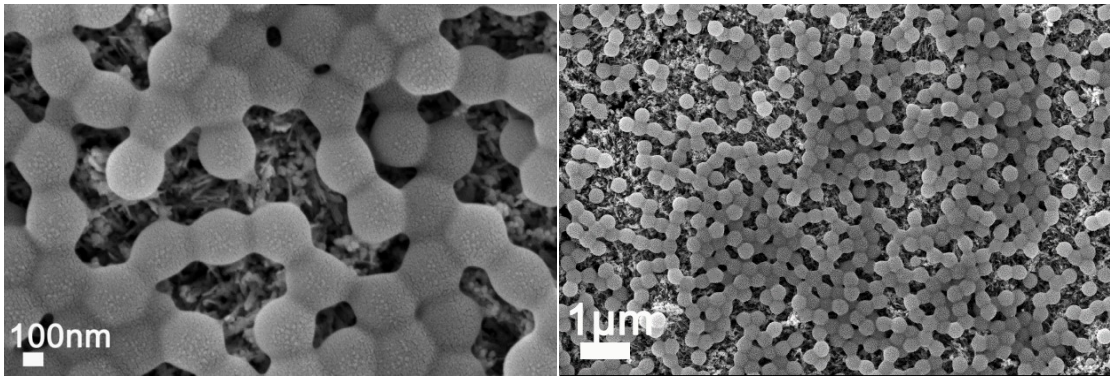

Figure S9. SEM images of PS sphere after heating at 130 °C in the dark for 4 h.

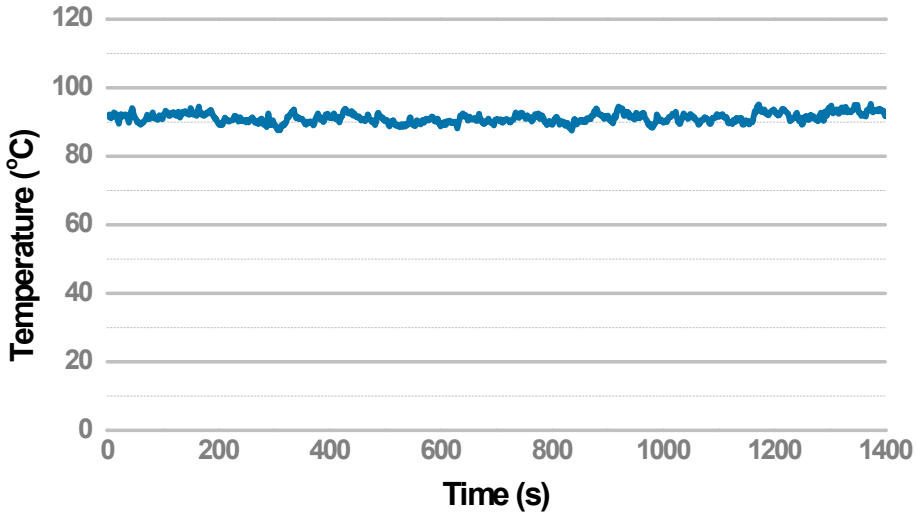

Figure S10. The catalyst surface temperature during reaction (0.33 W/cm^2, 75 °C).

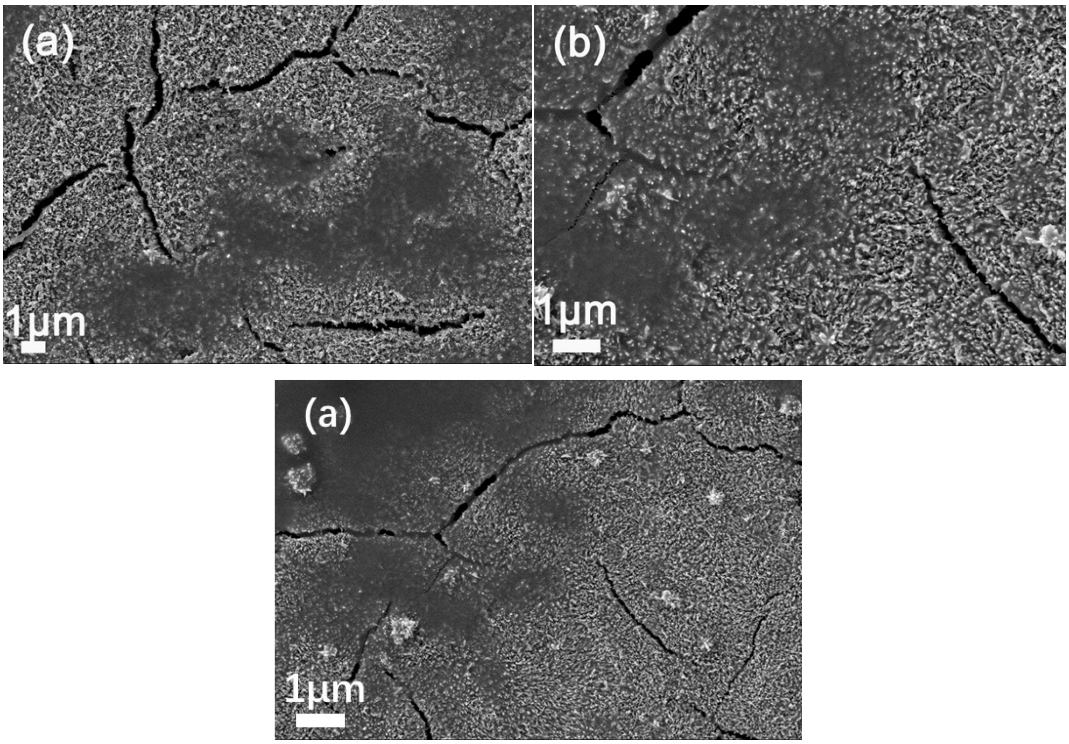

Figure S11. The influence of light wavelength (a) λ≥550 nm (b) λ≥660 nm for the PS degradation on α-Fe_2O_3/TiO_2HNTAs. The light intensity is kept at 0.5 W/cm^2 while the temperature is 75 ^oC, irradiation time 4 h.

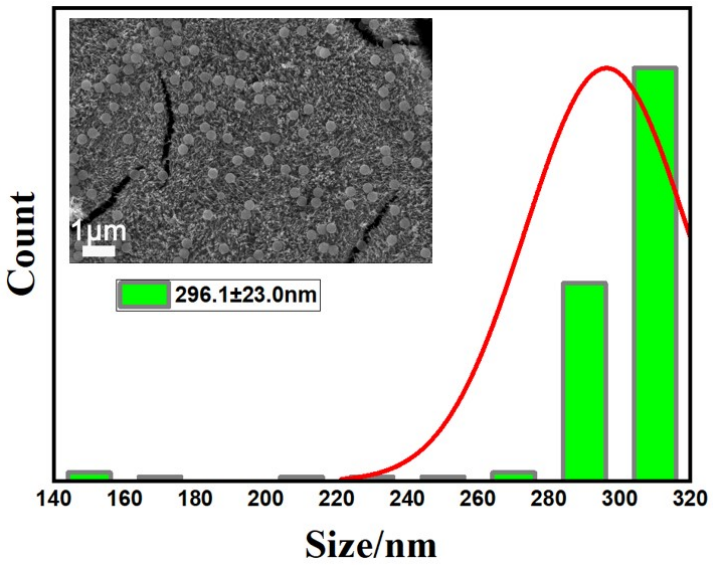

Figure S12. SEM images and size distribution of PS sphere on α-Fe_2O_3/TiO_2HNTAs. The light intensity is kept at 0.5 W/cm^2 while the temperature is 55 ^oC, irradiation time 4 h.

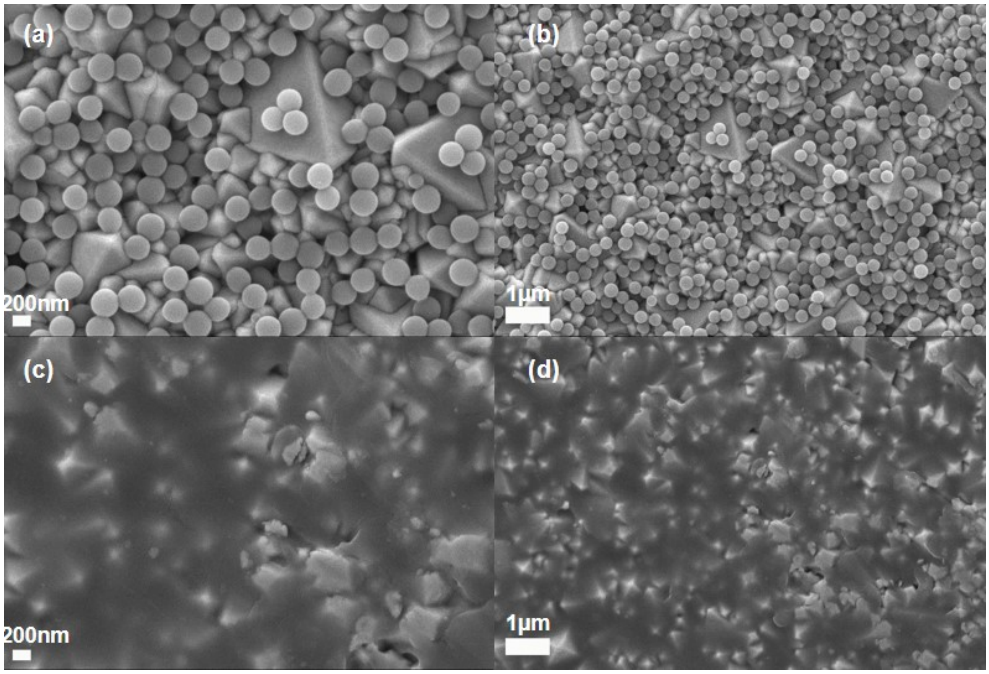

Figure S13. The SEM images for PS spheres before (a, b) and after degradation for 4 h over Cu_2O/TiO_2HNTAs catalyst (c, d)

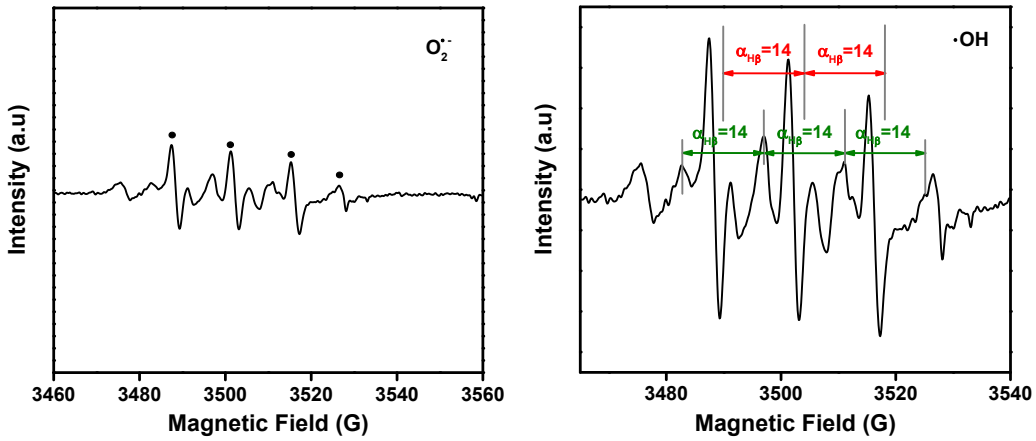

Figure S14. The ESR analysis for the DMPO in methanol solution after immersing α-Fe_2O_3/TiO_2HNTAs film under light irradiation.

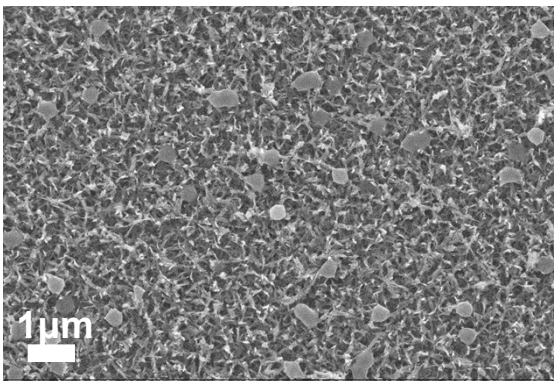

Figure S15. The SEM images for PS spheres after degradation over α-Fe_2O_3/Ti for 4 h.