Supporting Information

Thermal and (photo-)catalytic properties poly(N-isopropylacrylamide) stabilized gold nanoparticles induced by radiolysis

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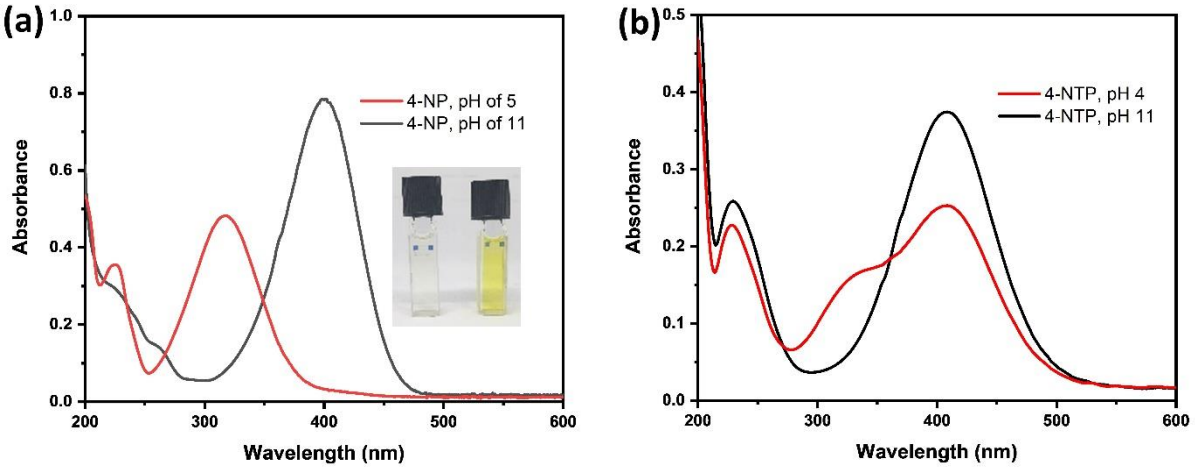

Fig. S1 (a) Absorption spectra of aqueous solutions containing 4.35 × 10^{-5} M 4-NP at pH 5 (red curve) and pH 11 (black curve) (inset: photographs of the cuvettes containing the solutions at pH 5 (left) and pH 11 (right)) and (b) Absorption spectra of aqueous solutions containing 4.35 × 10^{-5} M 4-NTP at pH 4 (red curve) and pH 11 (black curve).

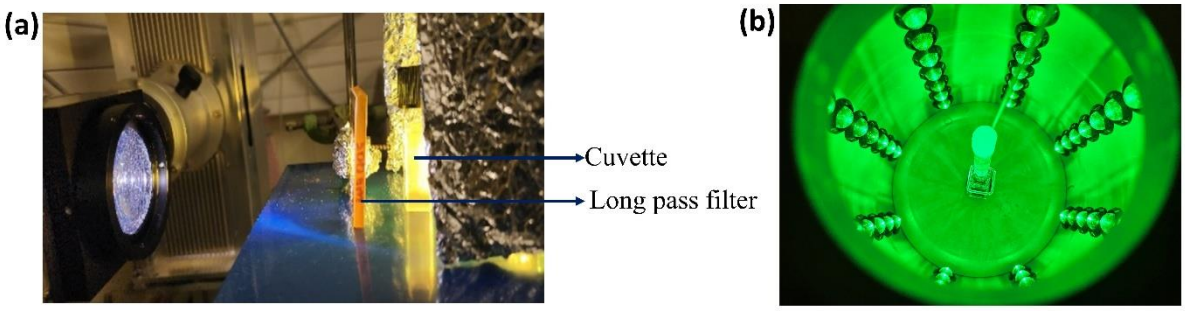

Fig. S2 Experimental setup used for the photocatalytic test (a) Solar lamp (b) LED (525 nm) reactor

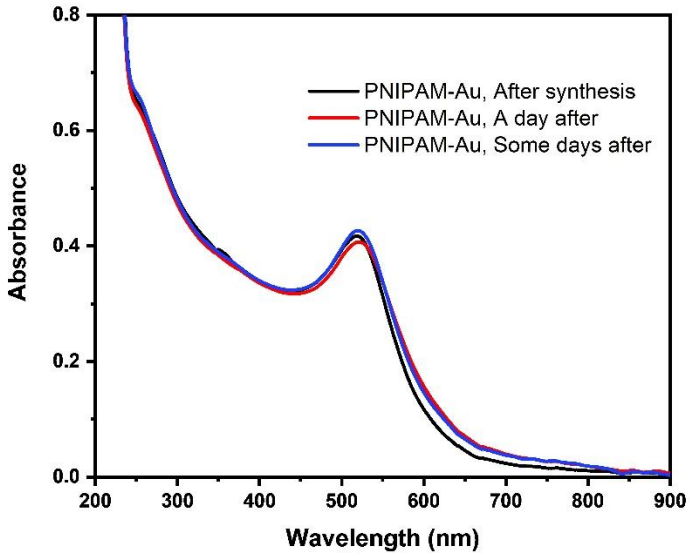

Fig. S3 Absorption spectra of the irradiated aqueous solution containing 1.48×10^{-4} M $HAuCl_4$, 7.84×10^{-3} M PNIPAM, and 0.2 M propan-2-ol (dose: 1.1 kGy) taken at different times after irradiation (optical path: 1cm).

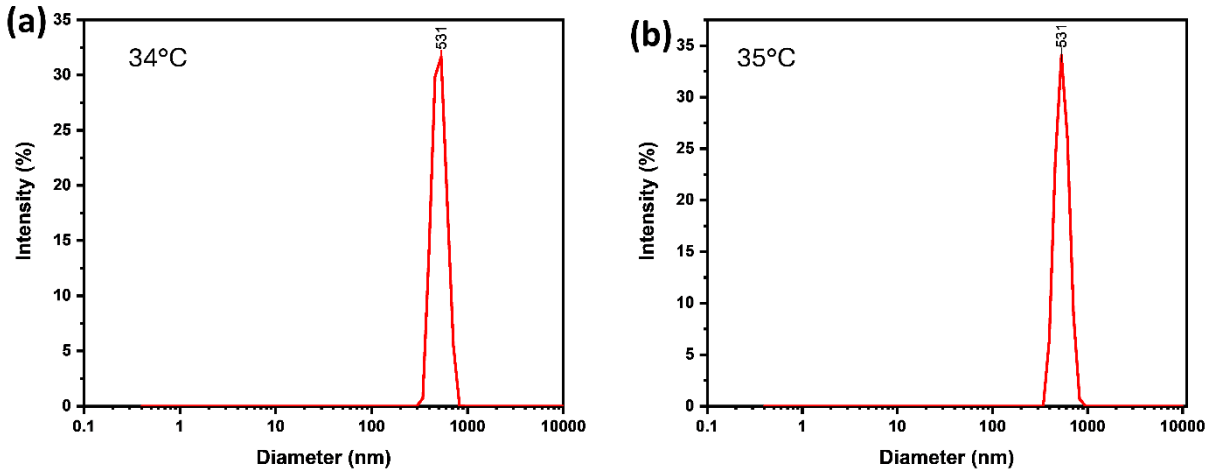

Fig. S4 Hydrodynamic size distribution measured by the DLS scattering for PNIPAM-AuNPs in aqueous solution at temperature above the LCST (a) 34°C (a) 35°C

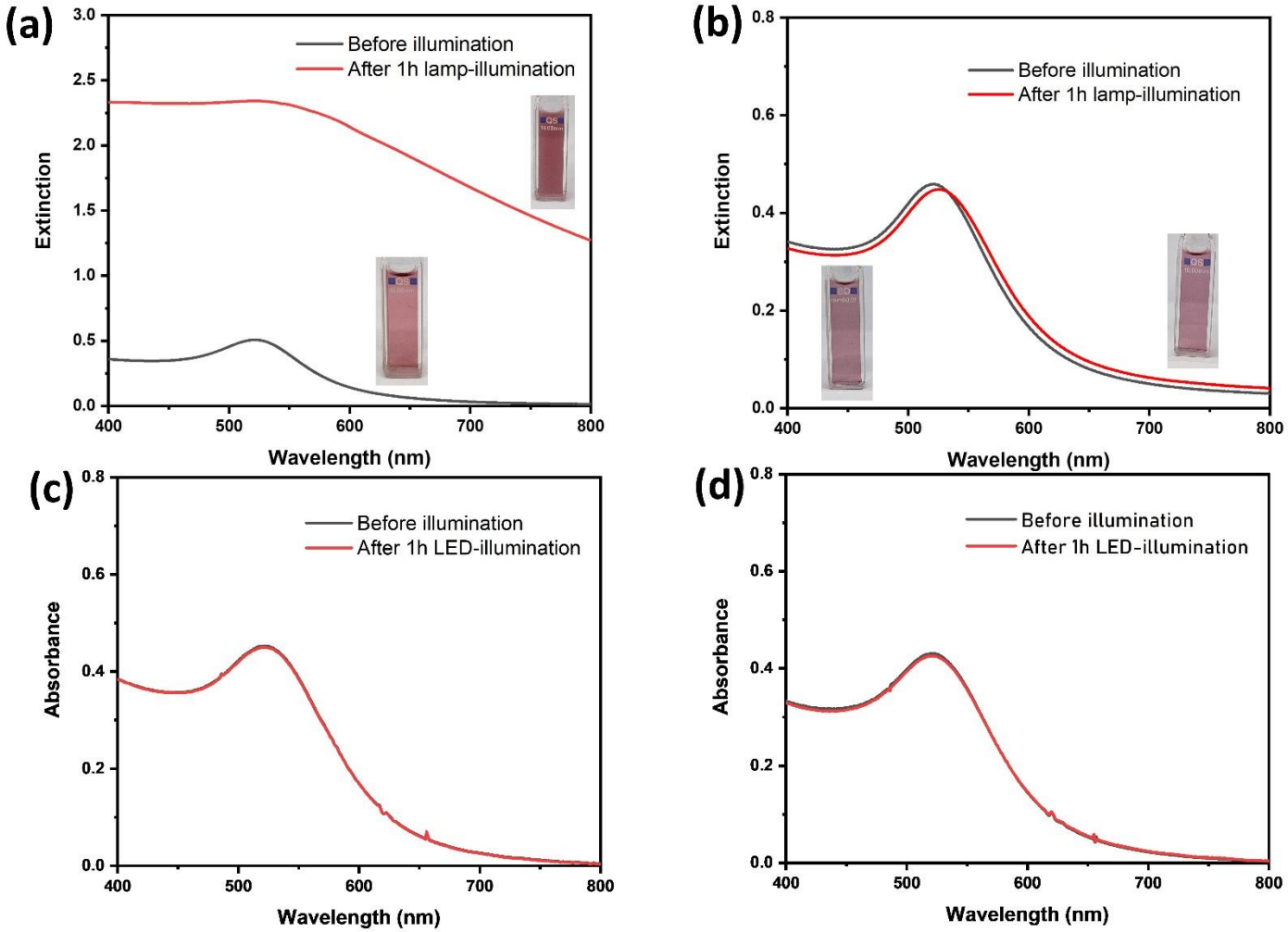

Fig.S5 UV-visible absorption spectrum obtained before and after 1 h of illumination for (a) PNIPAM-AuNPs and (b) NIPAM-AuNPs under solar lamp; (c) PNIPAM-AuNPs and (d) NIPAM-AuNPs under LED reactor (525 nm) (inset, corresponding visual appearance of the colloidal solutions)

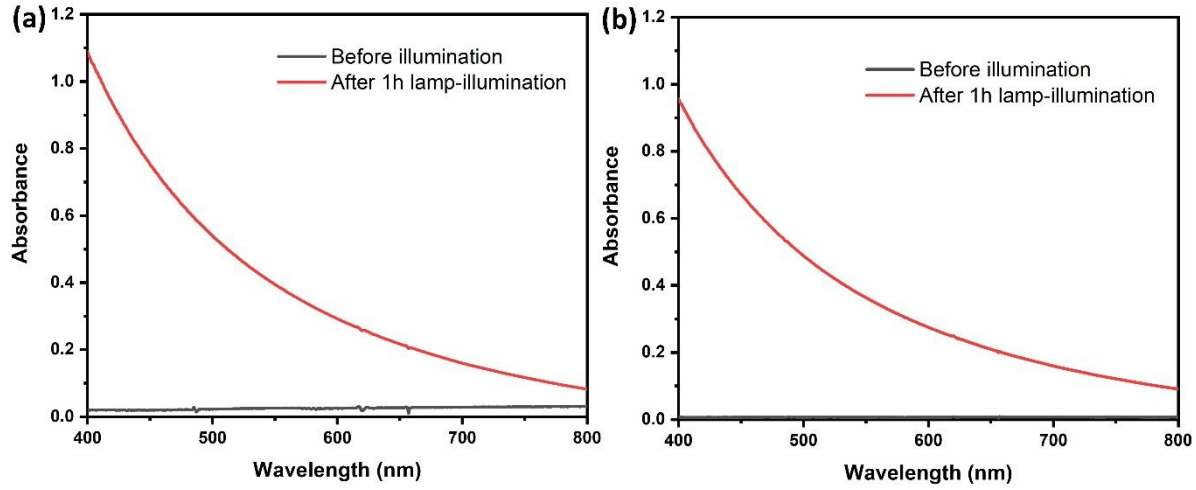

Fig. S6 UV-visible absorption spectrum obtained before and after 1h of illumination under a solar lamp for (a) non-irradiated PNIPAM solution and (b) irradiated PNIPAM solution

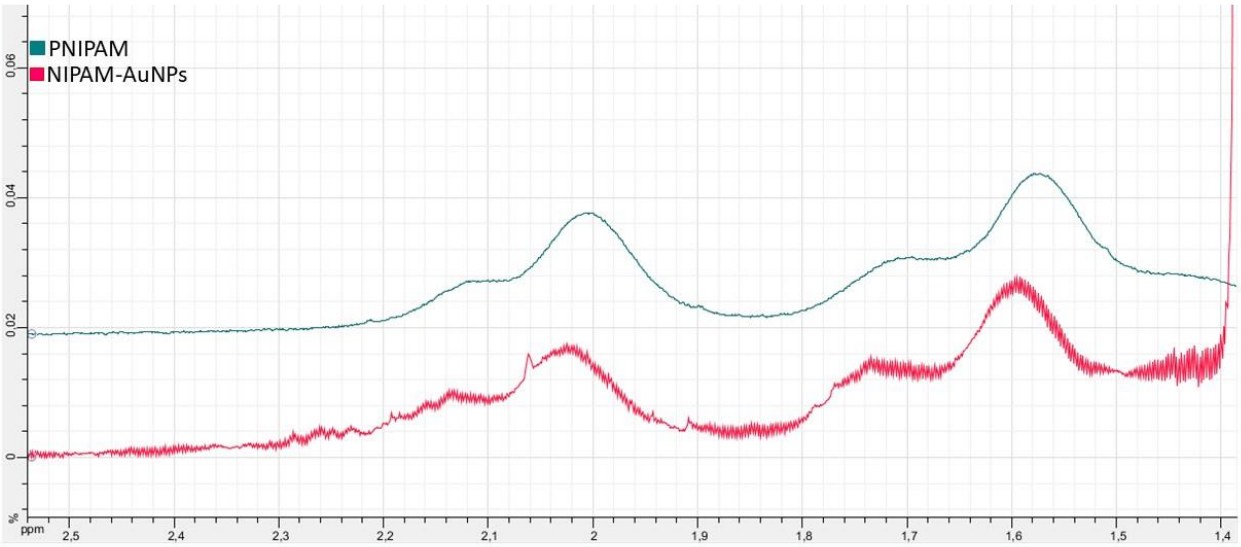

Fig. S7 ^{1}H NMR spectrum of PNIPAM and NIPAM-AuNPs in D_2O solution

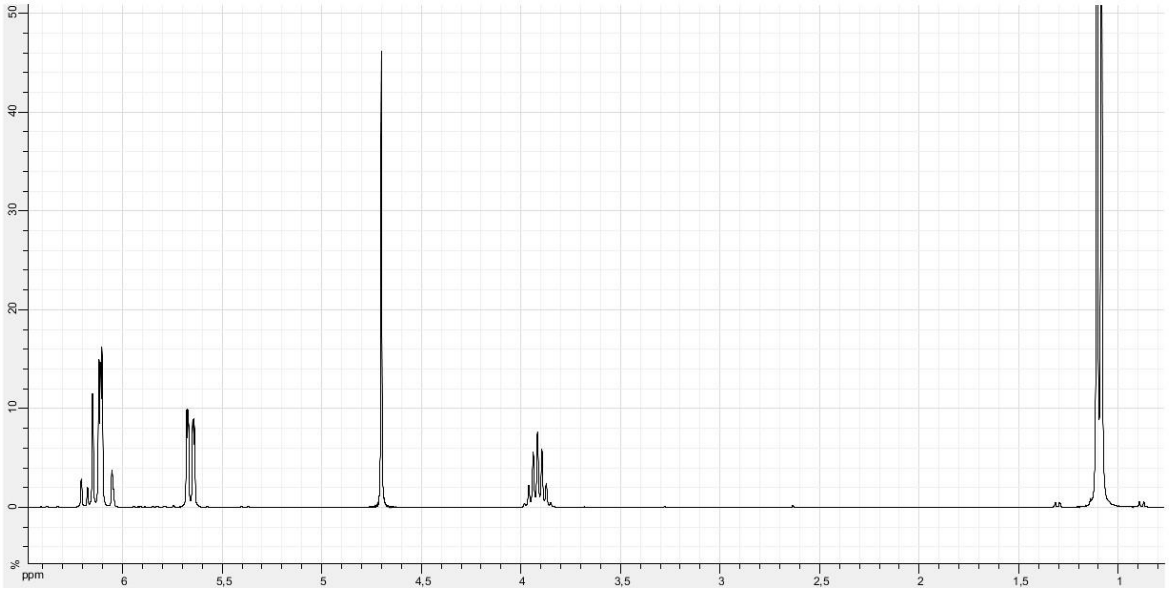

Fig. S8 ^{1}H NMR spectrum of NIPAM in D_2O solution

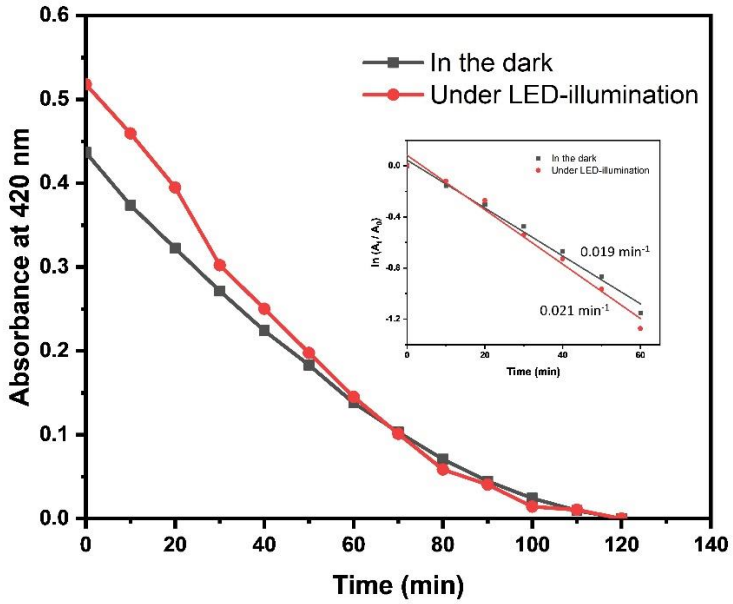

Fig. S9 Plot of the absorbance A at 420 nm due to $[Fe(CN)_6]^{3-}$ versus time; inset: plots of ln (A_t/A_0) as a function of time

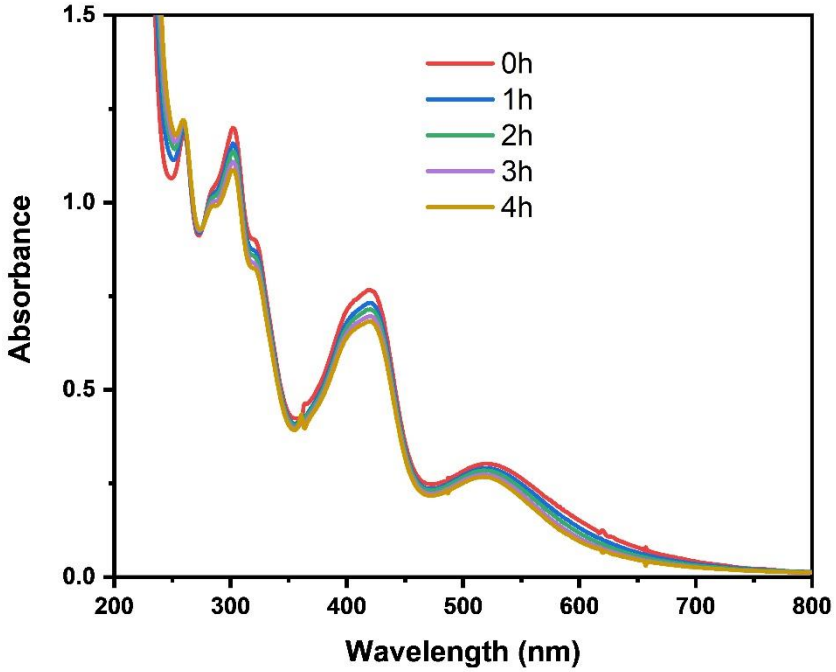

Fig. S10 Absorption spectra of aqueous solution containing initially 5×10^{-4} M $K_3Fe(CN)_6$ and NIPAM-AuNPs ($[Au^0] = 1.11 \times 10^{-4}$ M) in the dark.

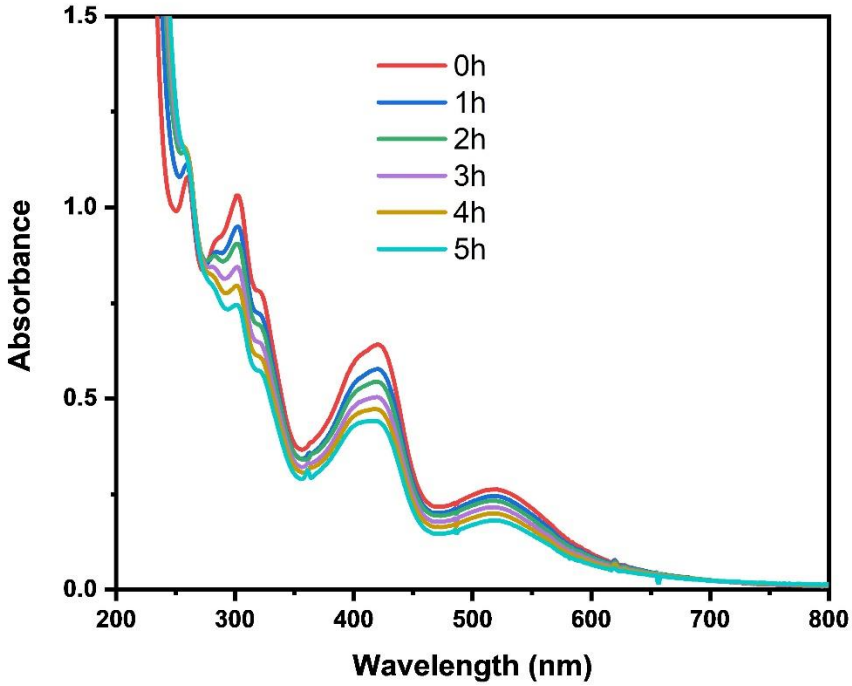

Fig. S11 Absorption spectra of aqueous solution containing initially 5×10^{-4} M $K_3Fe(CN)_6$ and PNIPAM-AuNPs ([Au^0] =1.11×10^{-4} M) under LED illumination.

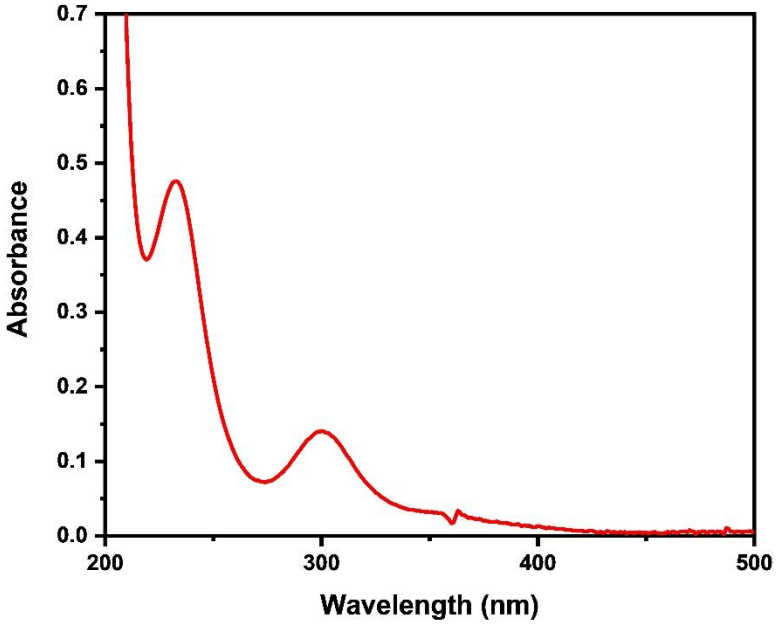

Fig. S12 Absorption spectrum of an aqueous solution containing 0.0815mM of commercial 4-AP

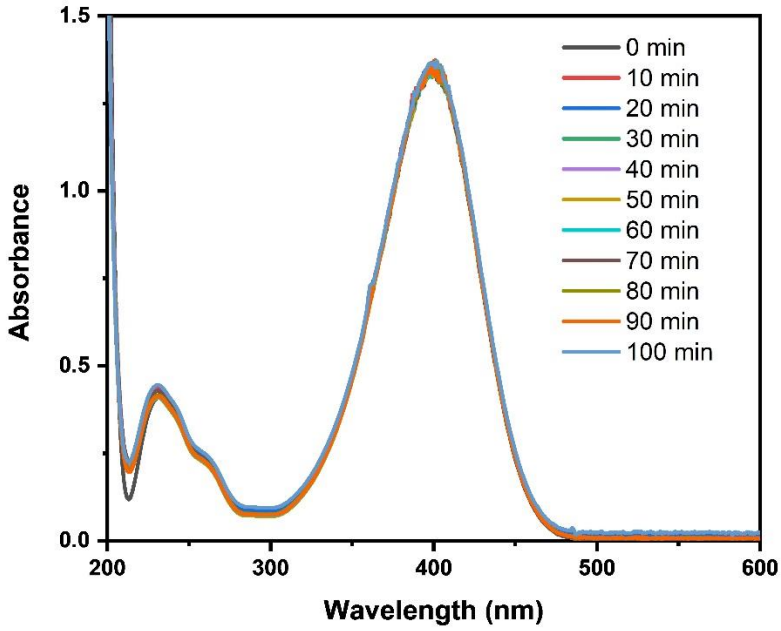

Fig. S13 Absorption spectra of an aqueous solution containing initially 0.0815 mM 4-NP and 11 mM $NaBH_4$ recorded at 10-minute intervals.

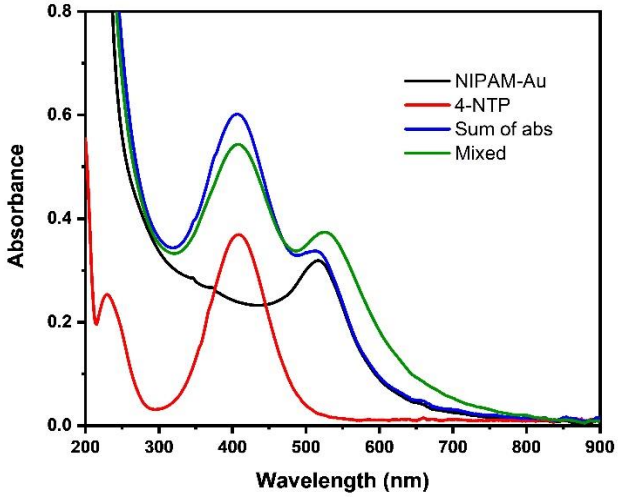

Fig. S14 UV-visible absorption spectra of aqueous solution containing 4-NTP at pH 11 ([4-NTP] = 4.35×10^{-5} M) (red curve), NIPAM-AuNPs ([Au^0] = 1.077×10^{-4} M) (black curve), both 4-NTP and NIPAM-AuNPs after 40 min of degassing in the dark (green curve) and the sum of the spectrum of 4-NTP and NIPAM-AuNPs (blue curve)

Fig. S14 shows the UV-visible absorption spectrum of an aqueous solution containing 4-NTP and NIPAM-AuNPs after 40 min of degassing in the dark, as well as the absorption spectra of solutions of each compound at the same concentration and the spectrum calculated by summing the spectra of the two compounds. A shift and an increase in the LSPR band of NIPAM-AuNPs in the mixture are observed by comparison with the calculated spectrum (Fig. S14). This shift and increase are attributed to the effective adsorption of 4-NTP on the surface of the nanoparticles prior to irradiation, which alters the chemical environment of the NPs and modifies the LSPR band.

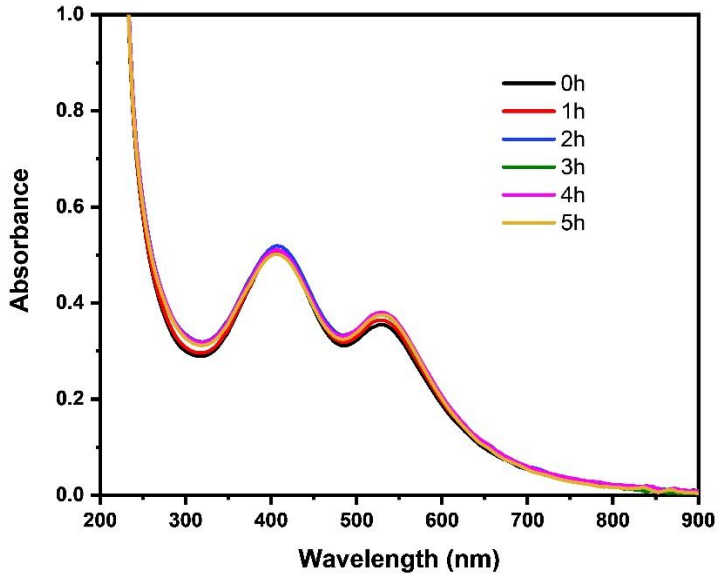

Fig. S15 Absorption spectra of aqueous solution containing initially 4.35×10^{-5} M 4-NTP and NIPAM-AuNPs ($[Au^0] = 1.077 \times 10^{-4}$ M) in the dark.

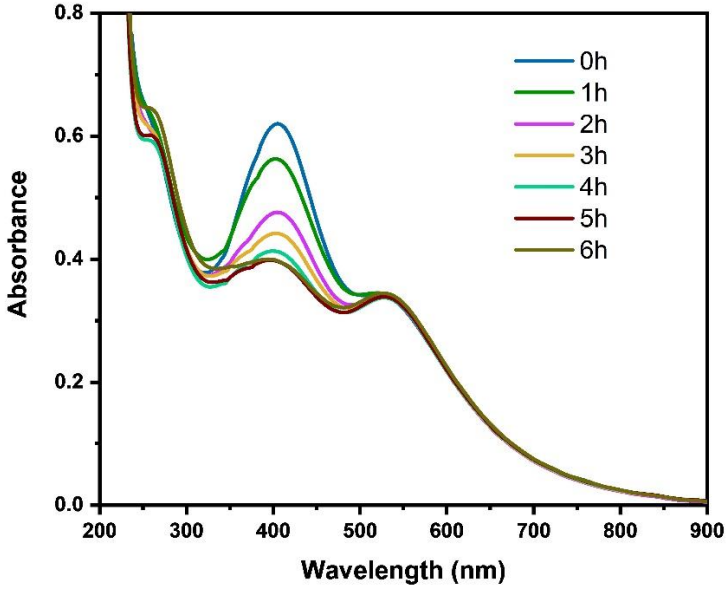

Fig. S16 Temporal evolution of the absorption spectra of 4-NTP under solar lamp illumination during the second catalytic cycle using PNIPAM-AuNPs

Fig S16 presents the second catalytic cycle of PNIPAM-AuNPs for the degradation of 4-NTP under solar lamp illumination. This was achieved by reusing the reaction mixture from the first cycle, without further purification, given the very small size of the nanoparticles, which makes their removal and purification challenging.