# Supporting Information

# Comprehensive Study on the Controlled Plasmon-Enhanced Photocatalytic Activity of Hybrid Au/ZnO Systems Mediated by Thermoresponsive Polymer Linkers

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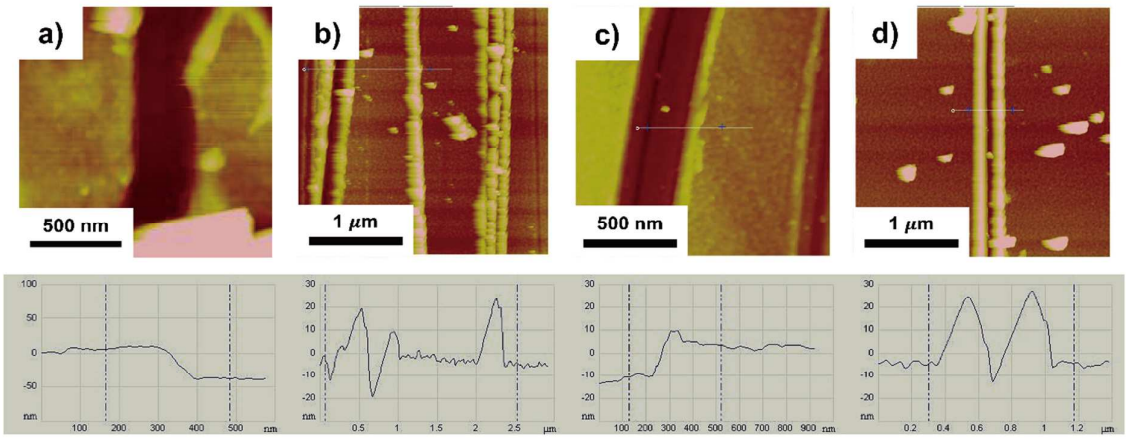


Figure S1. Height contrast AFM images and sectional profiles obtained from PNIPAM films with different molecular weight. Four types of PNIPAM samples were prepared with different polymerization time (a) 60 min (b) 45 min (c) 30 min (d) 15 min, respectively. The thickness of PNIPAM layer was decreased from 40 nm to 10 nm as the PNIPAM polymerization time was decreased.

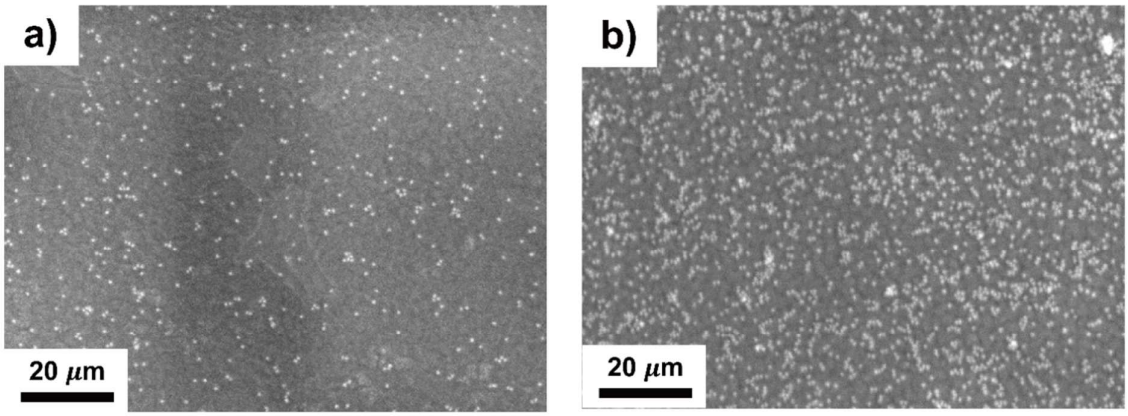


Figure S2. SEM images of citrate-capped AuNPs immobilized onto the amine-terminated PNIPAM layer with different molecular weight when the film was immersed in the AuNPs solution for 2 hr. Distinctly different density of AuNPs were immobilized onto the PNIPAM chains with low molecular weight (a) and high molecular weight (b).

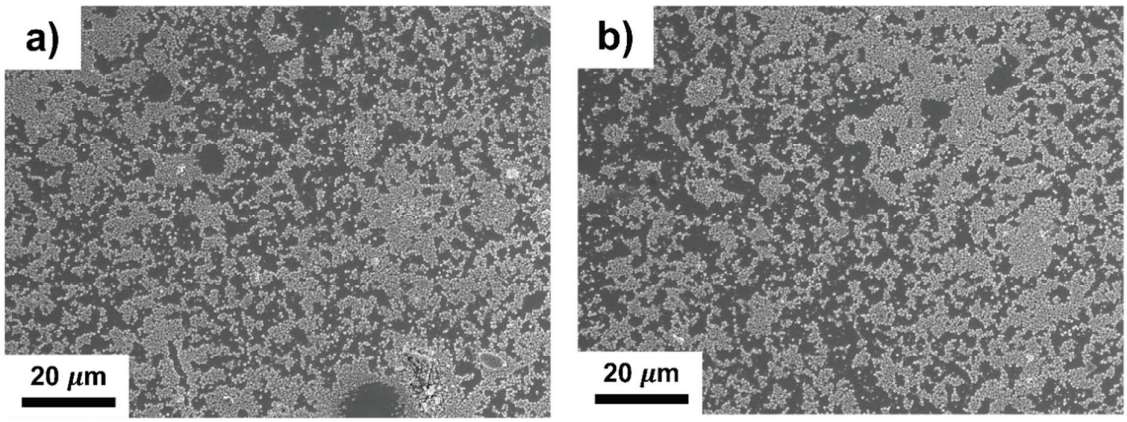


Figure S3. SEM images of ZnO nanoparticles immobilized onto the amine-terminated PNIPAM layers with different molecular weight when the film was immersed in the ZnO solution for 8 hr. Almost same amount of ZnO were immobilized onto the PNIPAM chains with low molecular weight (a) and high molecular weight (b).

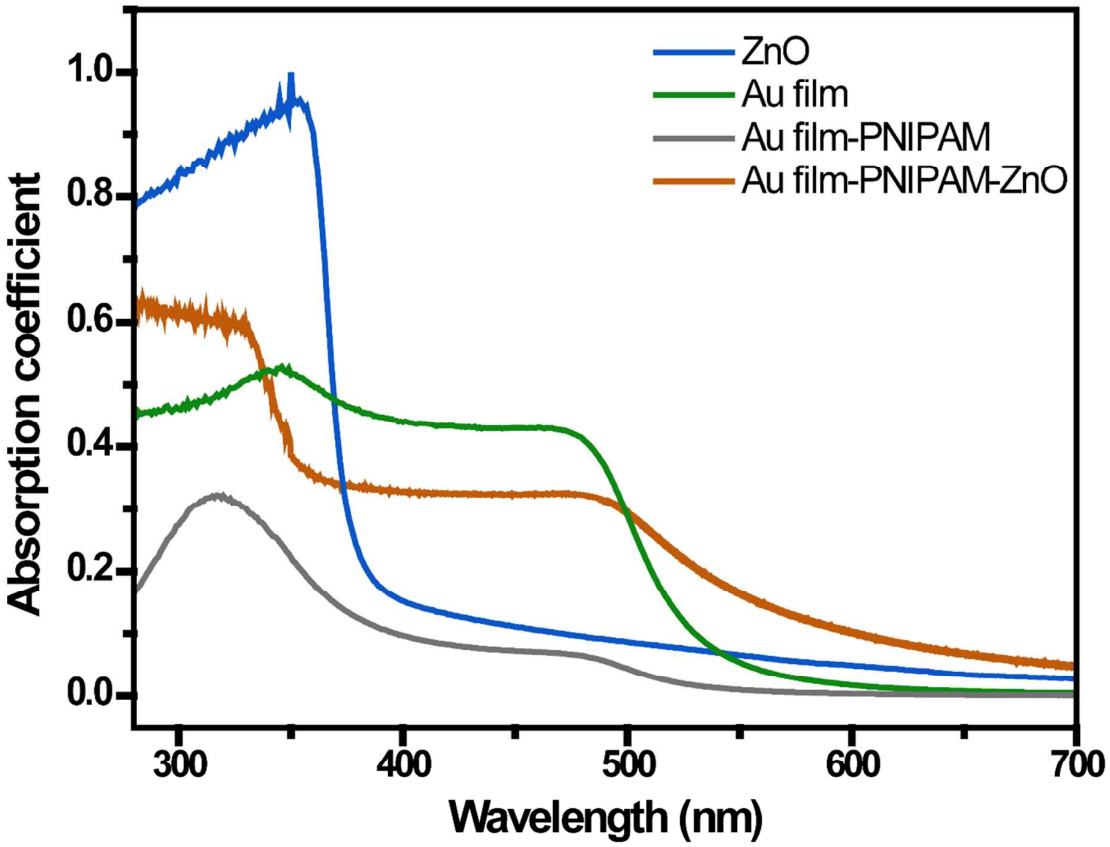


Figure 4. UV-Vis absorption spectra of four different samples. ZnO nanoparticle solution (blue), Au film (green), Au film-PNIPAM (grey), and Au film-PNIPAM-ZnO (orange).

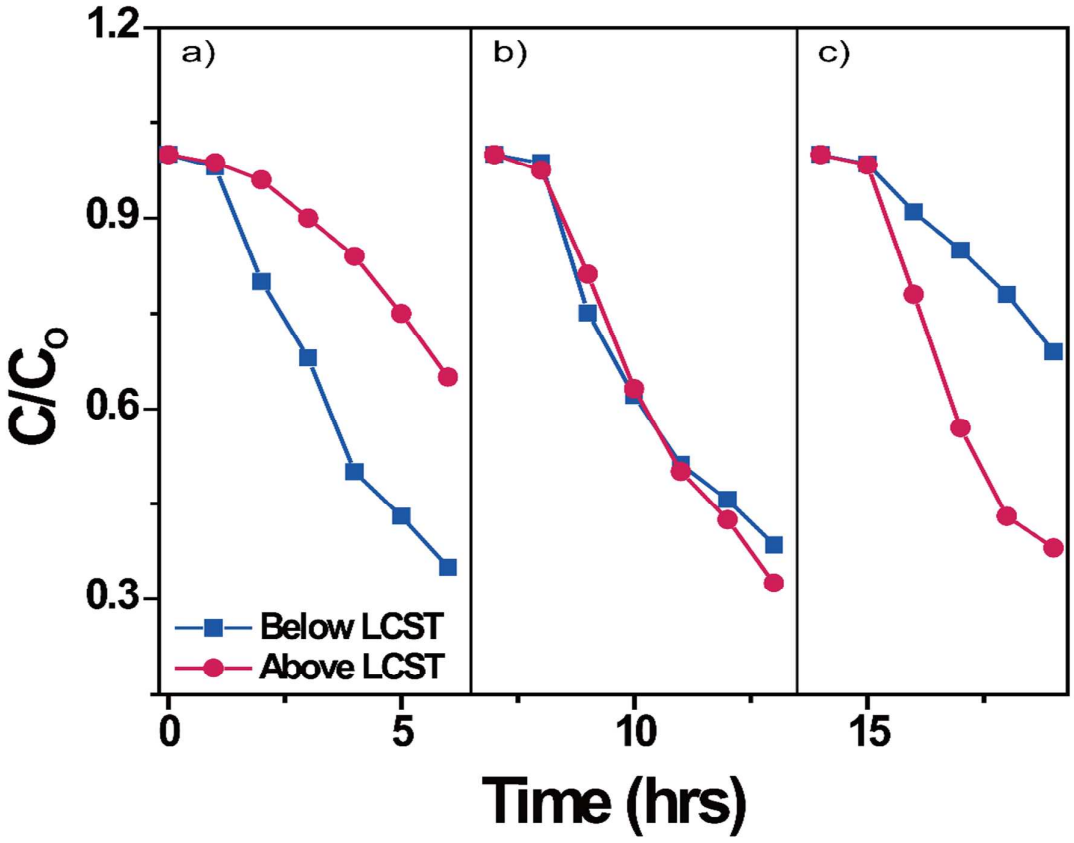


Figure S5. Decolorization efficiency versus time curves of Au film-PNIPAM-ZnO hybrid film with 3 types of PNIPAM density. In order to control the density of PNIPAM, Au film was immersed in initiator solution during (a) 1 hr, (b) 3 hr, (c) 24 hr.

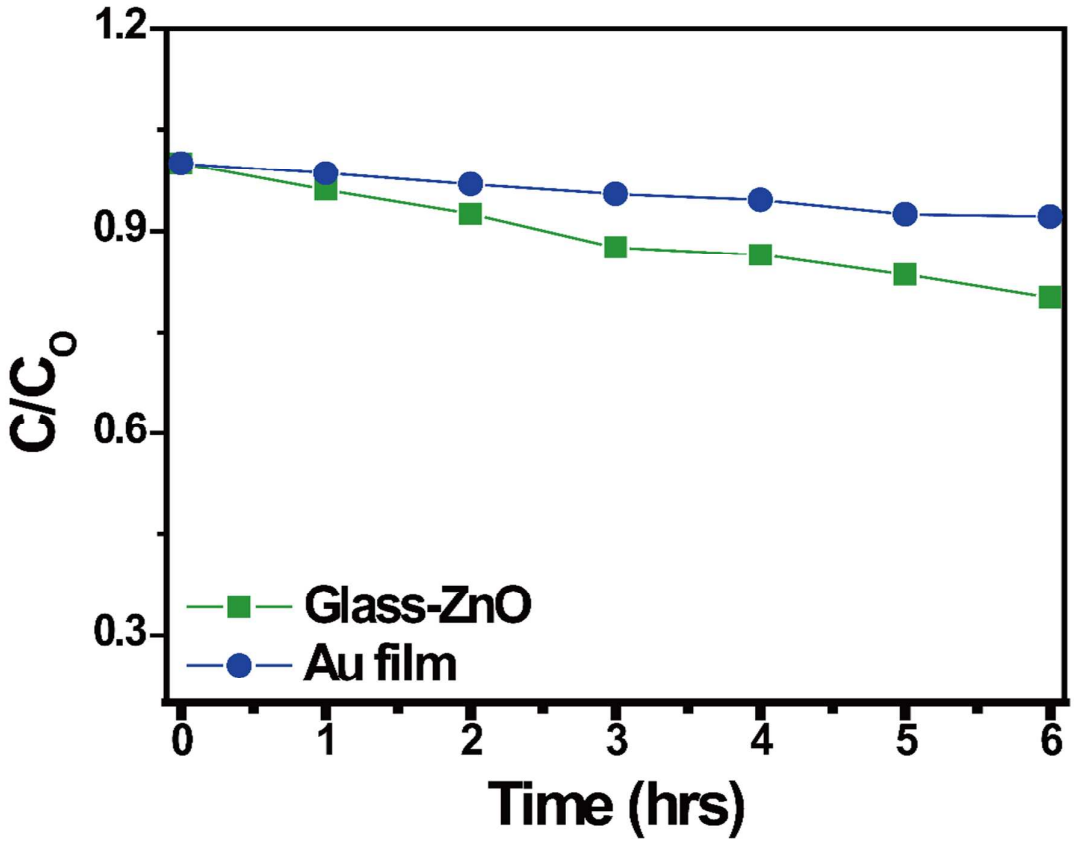


Figure S6. Decolorization efficiency versus time curves obtained from the Glass-ZnO (green) and bare Au film (blue) as control experiments under visible light.

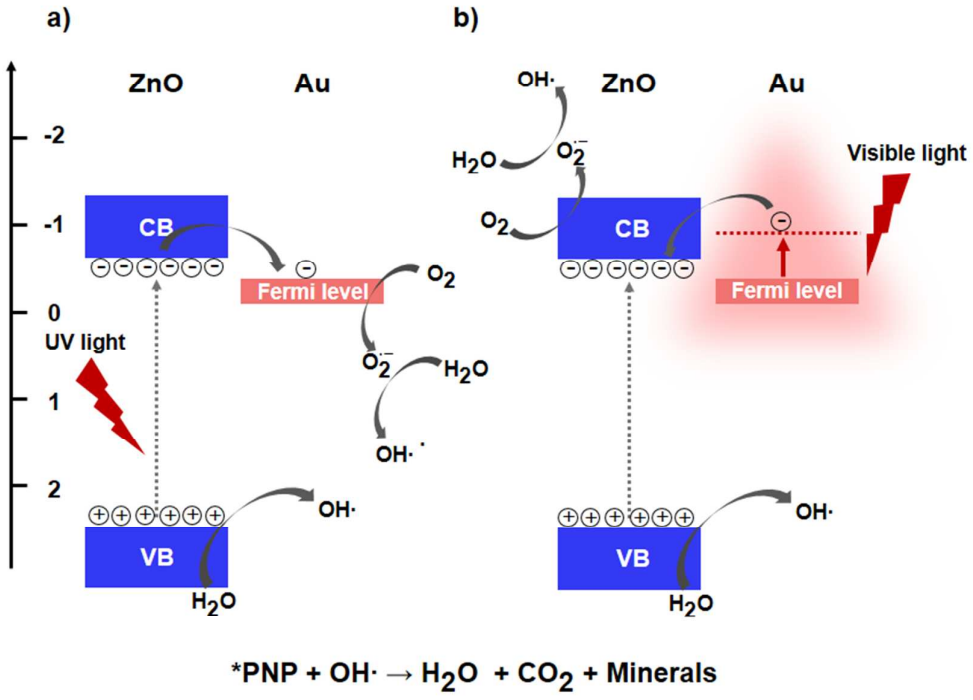


Figure S7. Schematic diagram of photocatalysis under irradiation of (a) UV light and (b) visible light with the Au film-PNIPAM-ZnO hybrid structure.

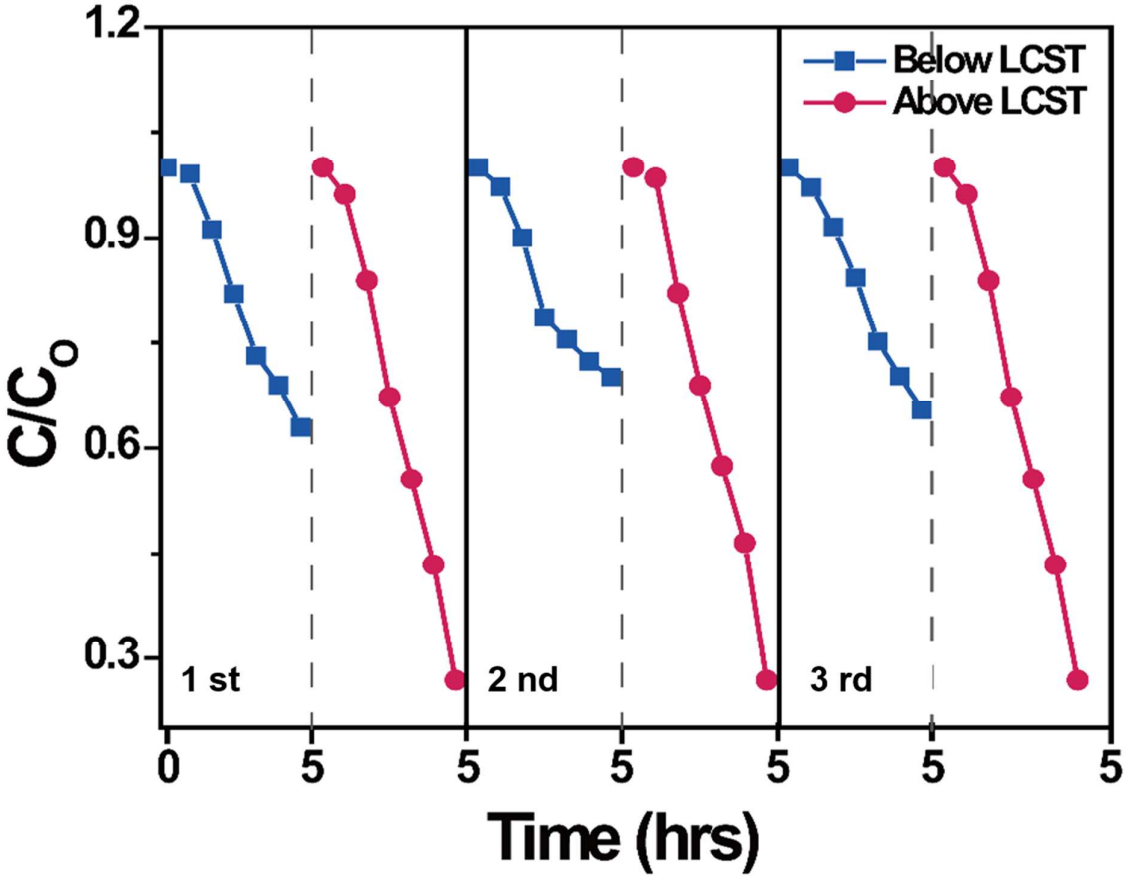


Figure S8. Cycling experiments of PNP degradation using Au film-PNIPAM (30 min)-ZnO with high PNIPAM density under UV-vis irradiation. The experiment was repeated at two different temperature, 28 $^{o}$C (below LCST; blue) and 35 $^{o}$C (above LCST; red), respectively.

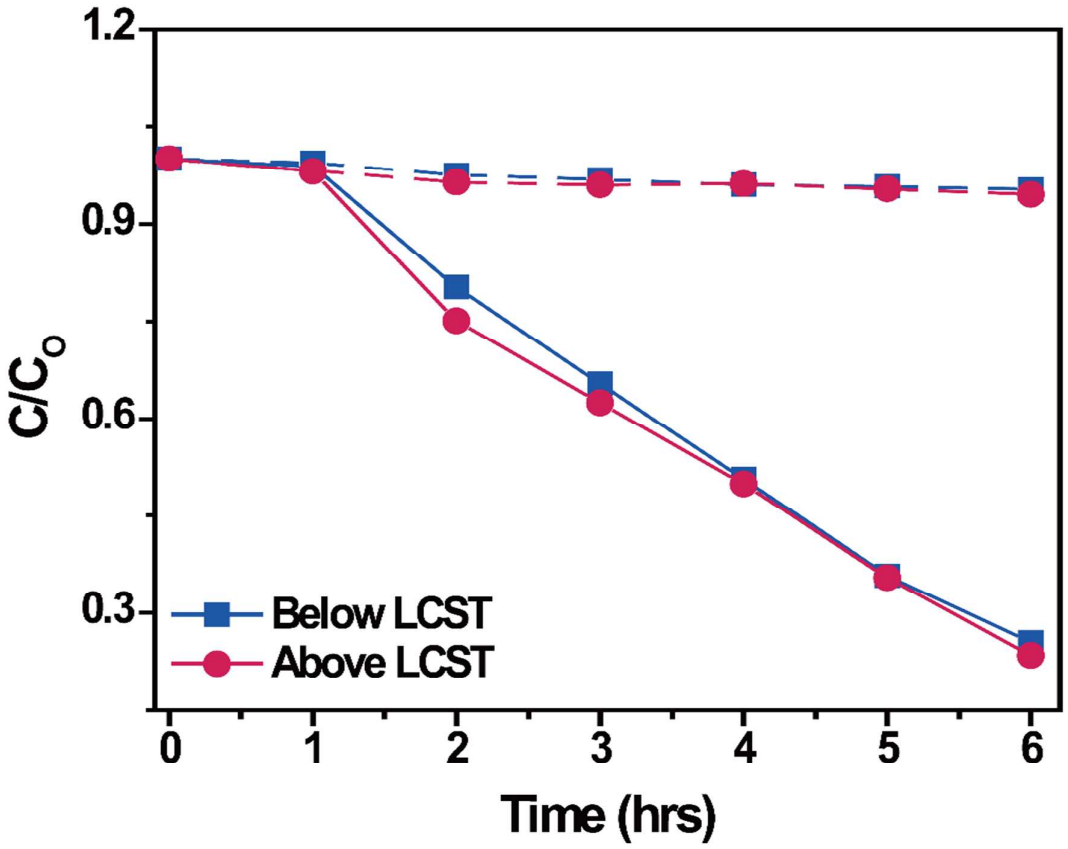


Figure S9. Decolorization efficiency versus time curves in terms of the degradation of the PNP without catalyst (dotted line) and Au film-ZnO catalyst (solid line) under UV-vis light illumination.

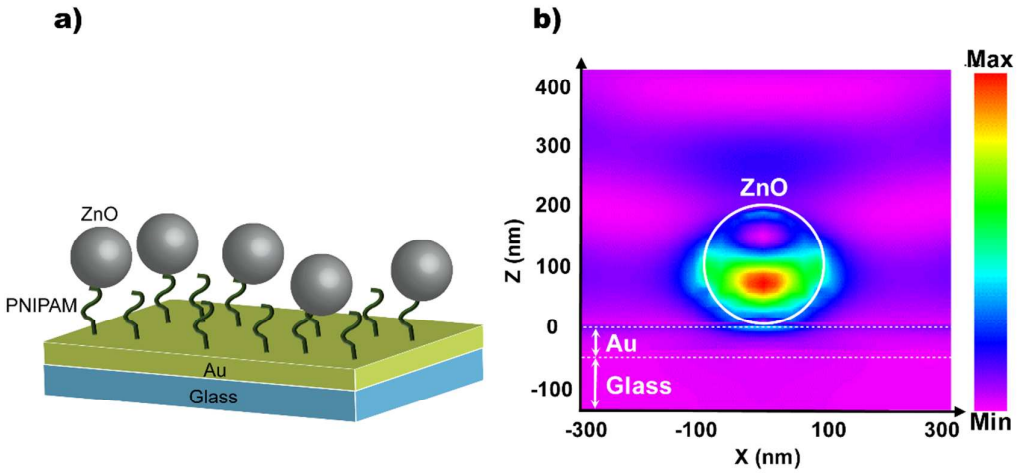


Figure S10. Schematic diagram of the structure for FDTD simulation (a) and electric field intensity distribution calculated by the FDTD analysis (b) of Au film-PNIPAM-ZnO hybrid film.