

Supplementary Information of

## **Modification of TiO<sub>2</sub> by Bimetallic Au-Cu Nanoparticles for Wastewater Treatment**

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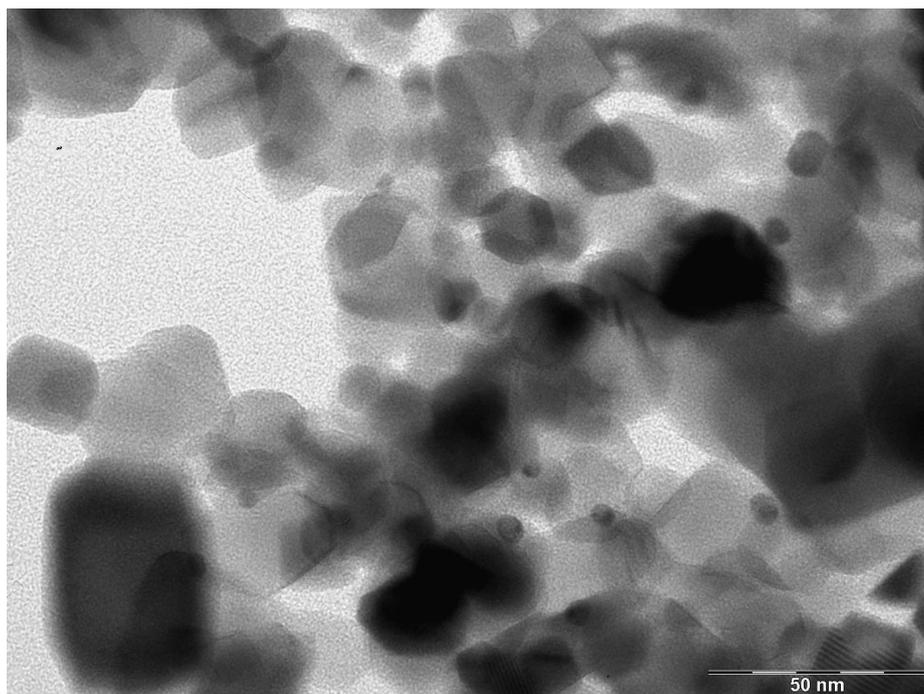
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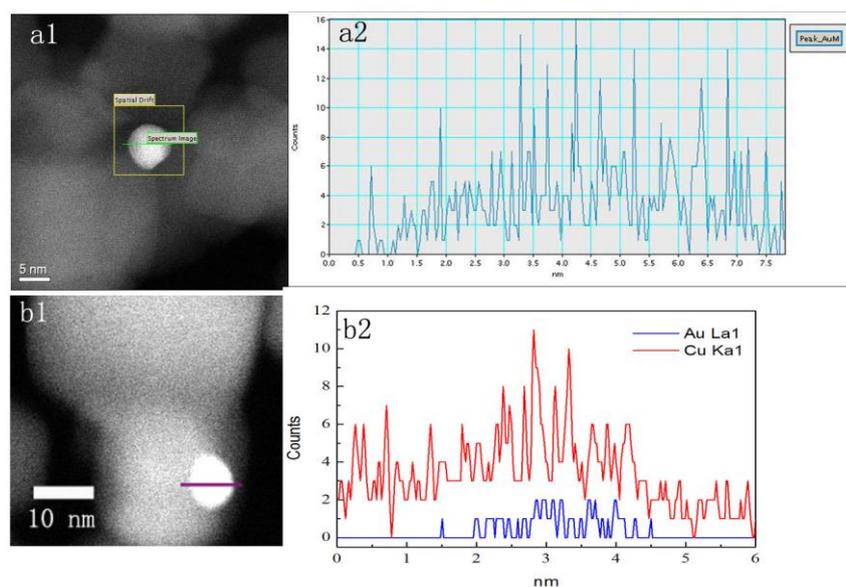
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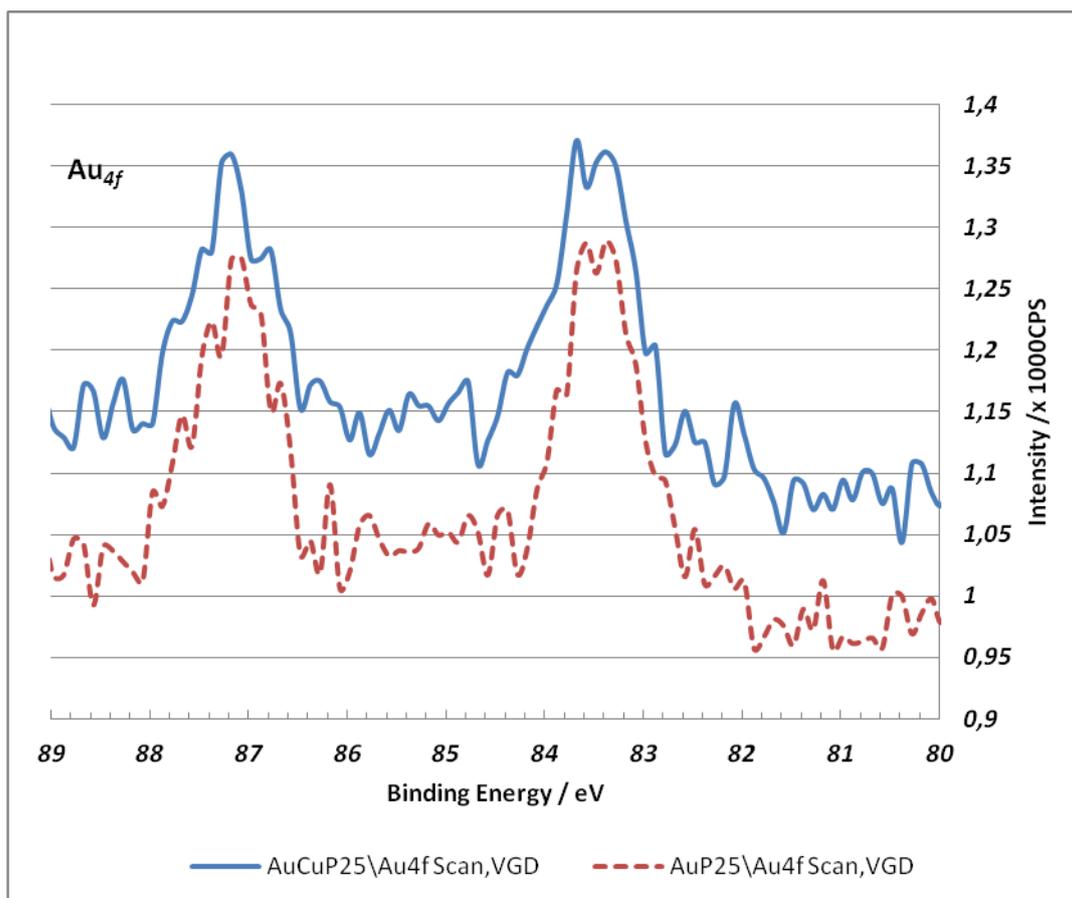
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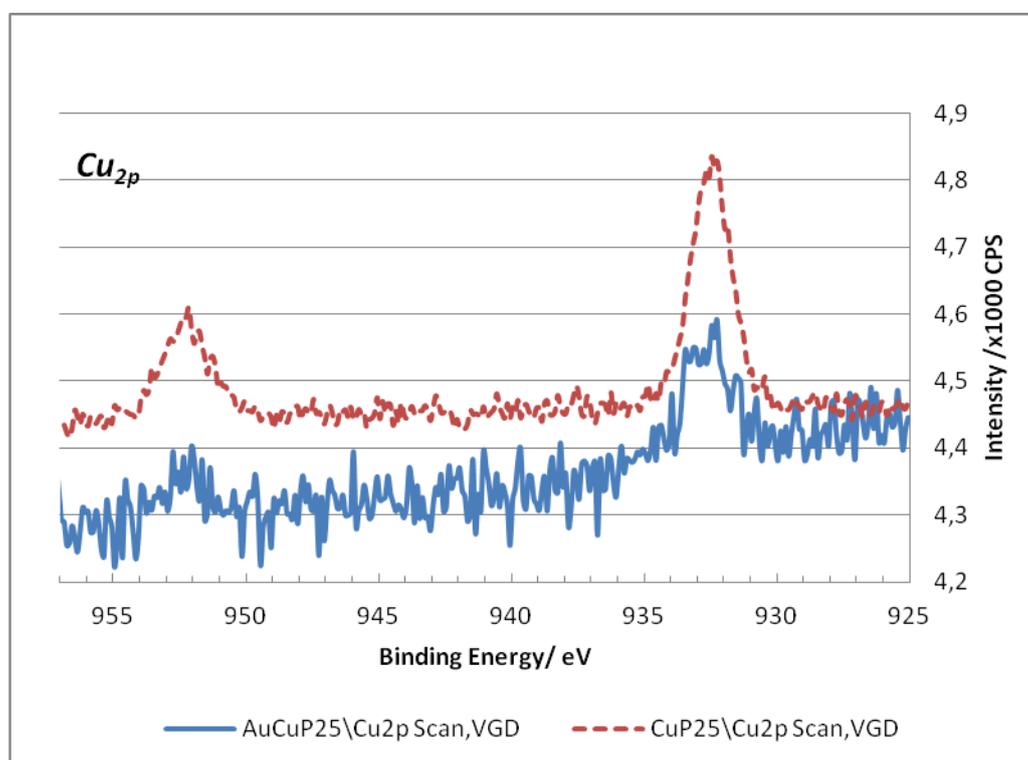
**Figure S1.** TEM image of AuCu1:3/P25 by the chemical method with THPC.



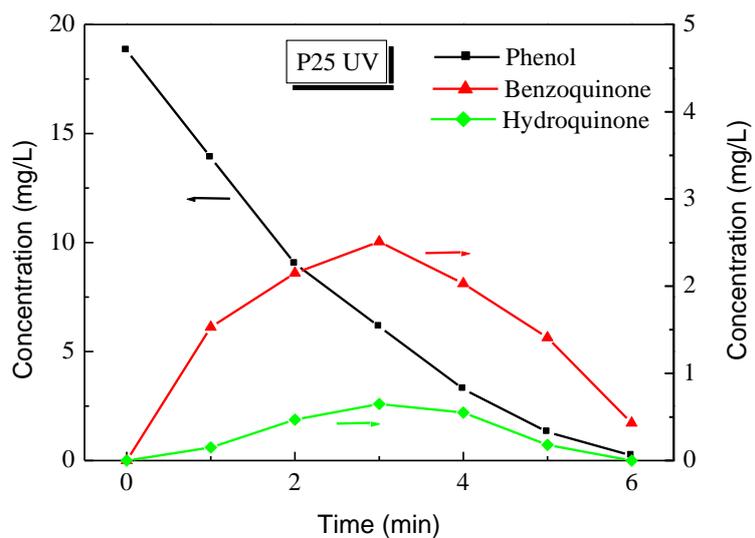
**Figure S2.** Energy dispersive X-ray spectroscopy line scans across external nanowires of nanoparticles (profiles were taken along the green line) and corresponding STEM images for the samples of (a) Au/P25, (b) AuCu1:3/P25. The blue line corresponds to CuK and the red one to AuL signal.



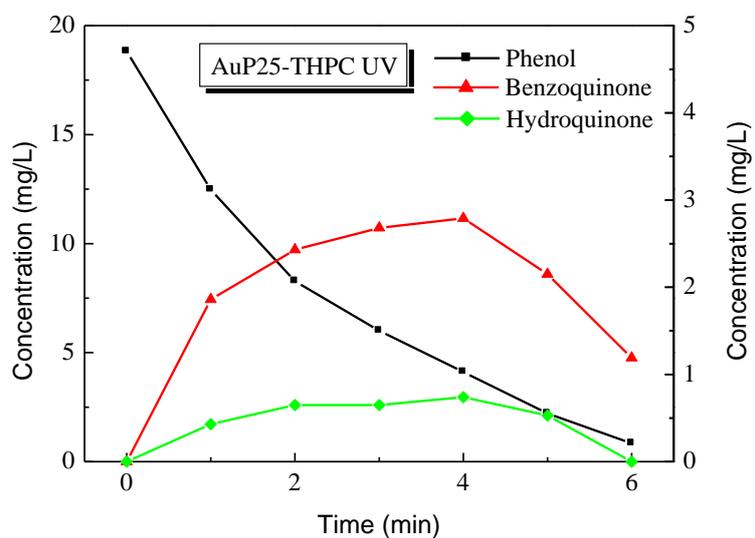
**Figure S3.** Au<sub>4f</sub> region of the XPS spectra of the sample AuCu1:1/P25 (blue) and Au/P25 (red).



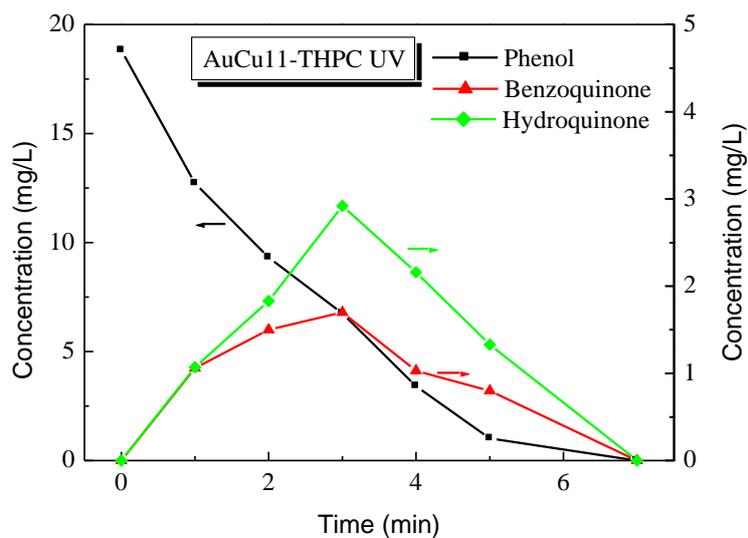
**Figure S4.** Cu<sub>2p</sub> region of the XPS spectra of the sample AuCu1:1/P25 (blue) and Cu/P25 (red).



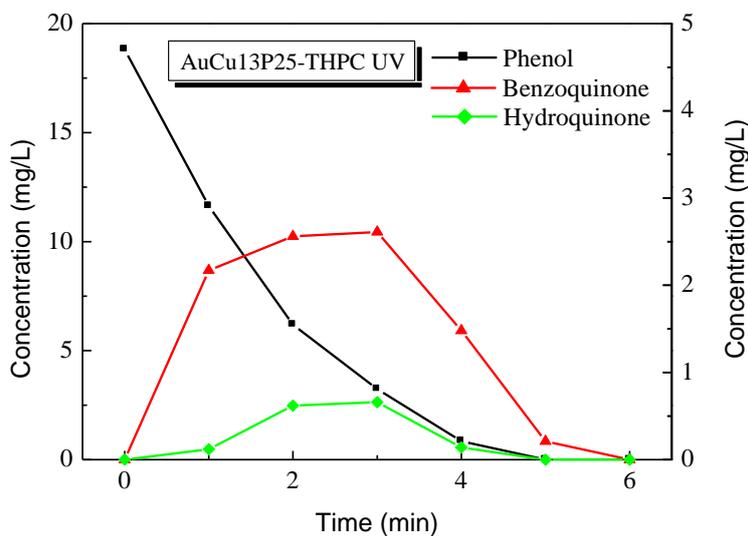
**Figure S5.** Photodegradation of Phenol by the photocatalyst of P25 under UV illumination. The initial concentration of Phenol is  $2 \times 10^{-4}$  M, which is equal to 18.82 ppm.



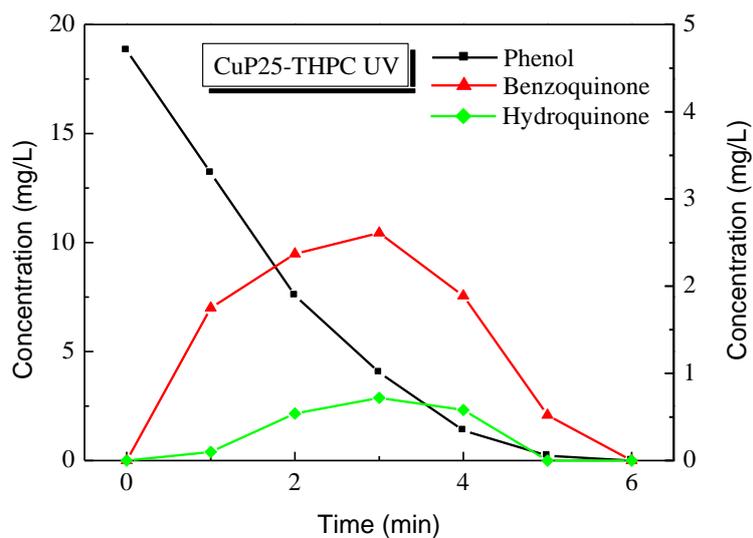
**Figure S6.** Photodegradation of Phenol by the photocatalyst of Au/P25 under UV illumination. The initial concentration of Phenol is  $2 \times 10^{-4}$  M, which is equal to 18.82 ppm.



**Figure S7.** Photodegradation of Phenol by the photocatalyst of AuCu1:1/P25 under UV illumination. The initial concentration of Phenol is  $2 \times 10^{-4}$  M, which is equal to 18.82 ppm.



**Figure S8.** Photodegradation of Phenol by the photocatalyst of AuCu1:3/P25 under UV illumination. The initial concentration of Phenol is  $2 \times 10^{-4}$  M, which is equal to 18.82 ppm.

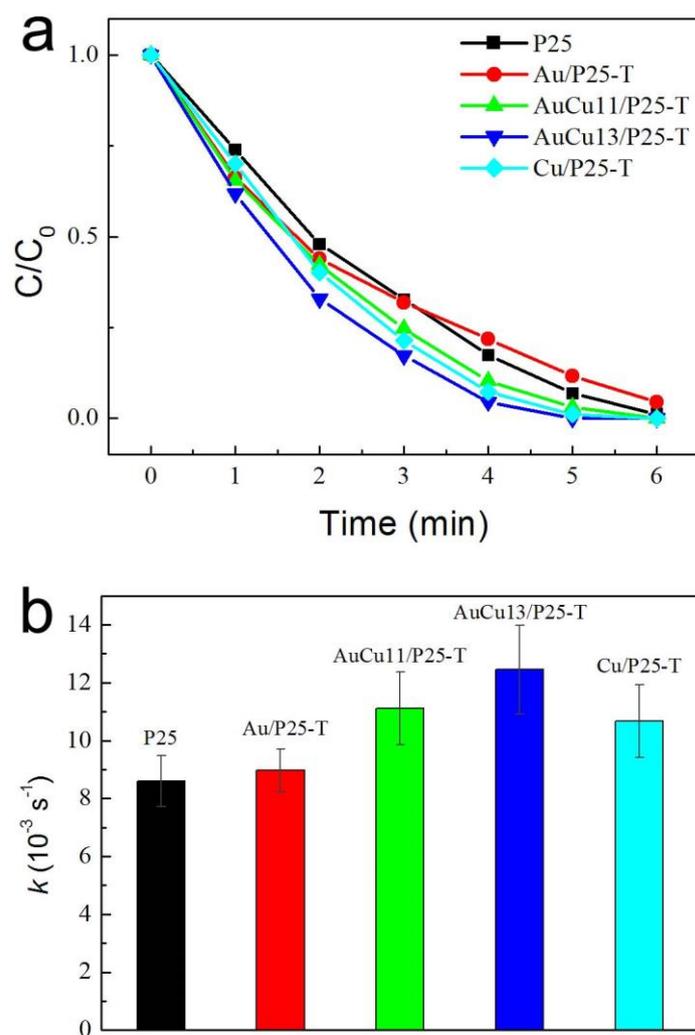


**Figure S9.** Photodegradation of Phenol by the photocatalyst of Cu/P25 under UV illumination. The initial concentration of Phenol is  $2 \times 10^{-4}$  M, which is equal to 18.82 ppm.

**TABLE S1.** Rate constants of the first-order reaction of Phenol photodegradation

Samples	$K$ (rate constant) ( $10^{-3} \text{ s}^{-1}$ )	R (correlation coefficient)	B (intercept) (s)
P25	$0.0086 \pm 0.0009$	0.979	$0.19 \pm 0.16$
Au/P25	$0.0089 \pm 0.0007$	0.980	$0.14 \pm 0.16$
AuCu1:1/P25	$0.0111 \pm 0.0012$	0.976	$0.27 \pm 0.23$
AuCu1:3/P25	$0.0125 \pm 0.0015$	0.978	$0.20 \pm 0.22$
Cu/P25	$0.0107 \pm 0.0013$	0.980	$0.20 \pm 0.19$

These values are obtained by the ORIGIN 6.0 based on the data of photodegradation of Phenol. The data of  $\ln(C_t/C_0)$  versus time were simulated by linear fit without crossing through the zero mandatorily.



**Figure S10.** (a) The time courses of phenol relative concentration in photodegradation under UV illumination with pure P25, and modified P25 without thermal treatment, (b) the rate constants of the corresponding photodegradation.