

Supporting Information

Converting Light Energy to Chemical Energy: A New Catalytic Approach for Sustainable Environmental Remediation

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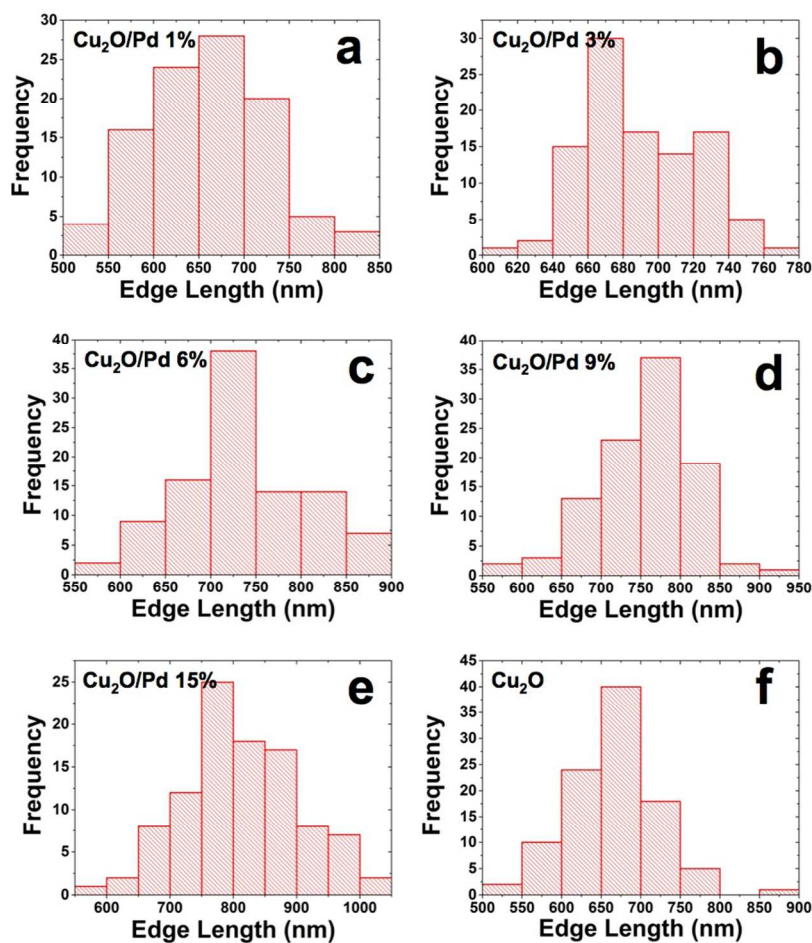


Figure S1. Size analysis of the $\text{Cu}_2\text{O}/\text{Pd}$ materials with a Pd mass of (a) 1%, (b) 3%, (c) 6%, (d) 9%, and (e) 15%. Panel (f) presents the size analysis of the bare Cu_2O cubes.

Table S1. ICP-OES Analysis for the Cu₂O/Pd Materials

	Pd wt%
Cu₂O/Pd 1%	0.92
Cu₂O/Pd 3%	2.35
Cu₂O/Pd 6%	5.65
Cu₂O/Pd 9%	7.62
Cu₂O/Pd 15%	14.99

Table S2. Pseudo-first-order rate constants for the PCB photodechlorination reactions for each of the Cu₂O/Pd materials indicated at a catalyst loading of 2 mg/mL

	$k_{\text{PCB 1}}$ (10 ⁻³ h ⁻¹)	$k_{\text{PCB 2}}$ (10 ⁻³ h ⁻¹)	$k_{\text{PCB 3}}$ (10 ⁻³ h ⁻¹)
Cu₂O/Pd 1%	2.4 ± 0.7	2.3 ± 0.5	7.7 ± 0.7
Cu₂O/Pd 3%	3.4 ± 0.5	2.7 ± 0.1	6.3 ± 0.3
Cu₂O/Pd 6%	2.5 ± 0.2	4.0 ± 0.2	7.7 ± 0.3
Cu₂O/Pd 9%	1.9 ± 0.1	11.0 ± 0.7	50.8 ± 2.9
Cu₂O/Pd 15%	2.4 ± 0.2	6.3 ± 0.3	36.5 ± 1.3

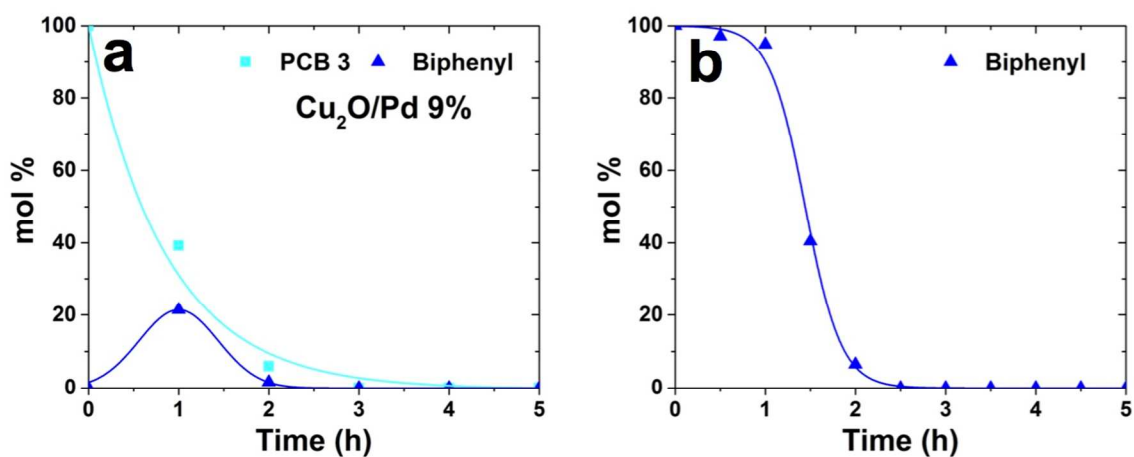


Figure S2. The overall reaction analysis for (a) the dechlorination of PCB 3 following H₂ being bubbled into the reaction for 5 h in the presence of Cu₂O/Pd 9% materials at a catalyst loading of 2 mg/mL while in the dark and (b) the aerosolization of biphenyl following H₂ being bubbled into the reaction for 5 h in the absence of a photocatalyst while in the dark. Note that lines are added to guide the eye.

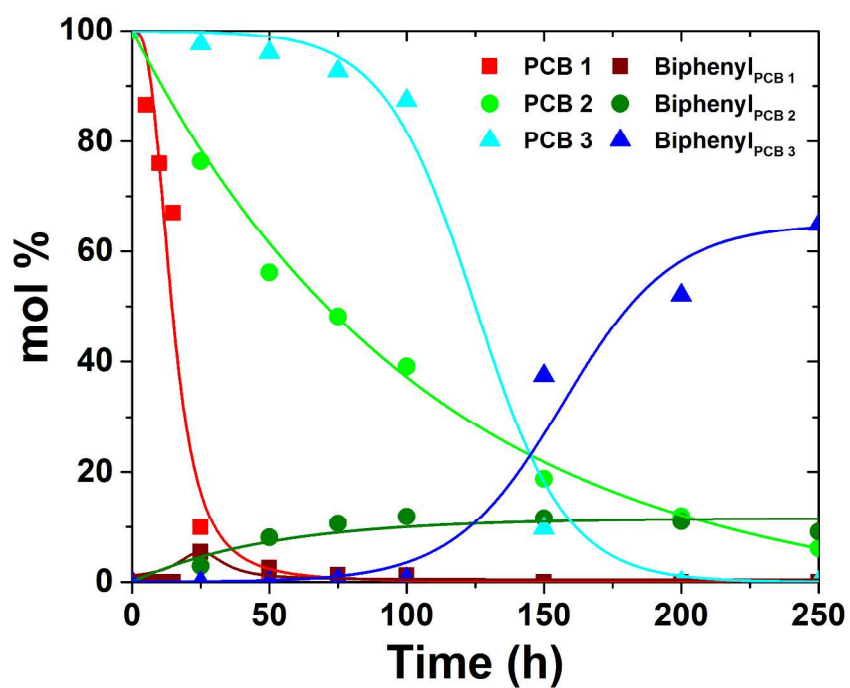


Figure S3 The overall reaction analysis for the photodegradation of PCBs 1, 2, and 3 following light irradiation for 250 h in the absence of a photocatalyst. Note that lines are added to guide the eye.

Table S3. Pseudo-first-order rate constants for the PCB 3 photodechlorination reaction using the Cu₂O/Pd 9% materials at the indicated catalyst loadings

Cu₂O/Pd 9%	1 mg/mL	2 mg/mL	3 mg/mL
$k_{\text{PCB 3}}$ (10^{-3} h^{-1})	17.6 ± 0.7	50.8 ± 2.9	9.9 ± 0.9

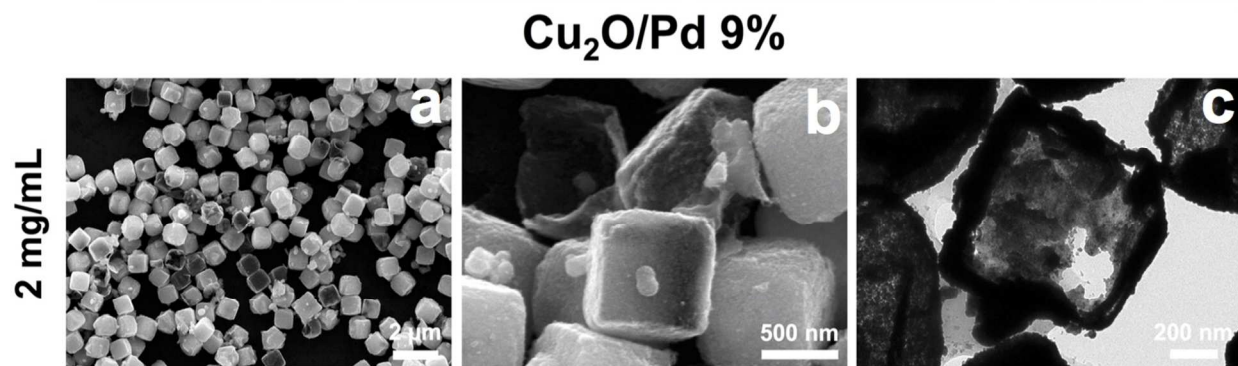


Figure S4. Additional SEM and TEM images of the Cu₂O/Pd 9% cubes presented for the post-dechlorination analysis. Parts (a-b) present SEM images and part (c) displays a TEM image when a catalyst loading of 2 mg/mL was used in the reaction.

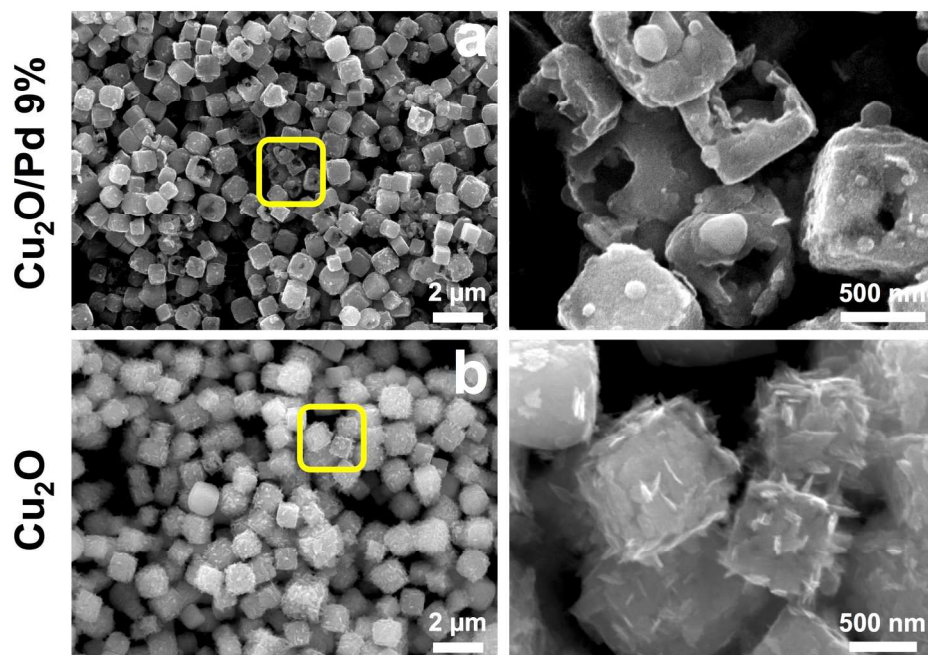


Figure S5. SEM images of (a) the Cu₂O/Pd 9% materials and (b) the bare Cu₂O cubes after being photoirradiated in ethanol/water for 250 h in the absence of PCB. The right panel shows the yellow box zoomed-in.

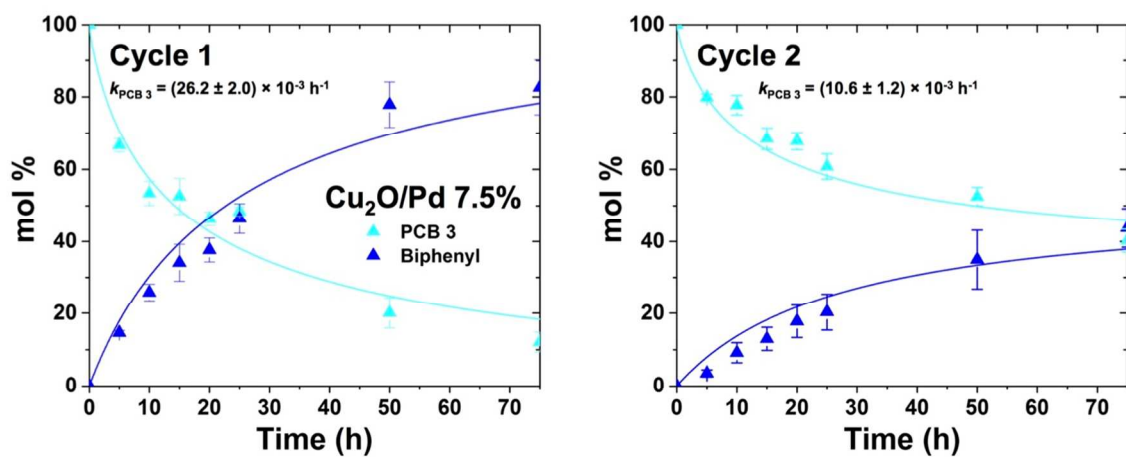


Figure S6. The reaction analysis for the recyclability study of the Cu₂O/Pd 7.5% materials for the photodegradation of PCB 3 at a catalyst loading of 2 mg/mL. Note that lines are added to guide the eye.