

Supplementary information
for
Synthesis of an Environmentally Friendly Modified Mulberry Branch-Derived Biochar Composite: High Degradation Efficiency of BPA and Mitigation of Toxicity in Silkworm Larvae

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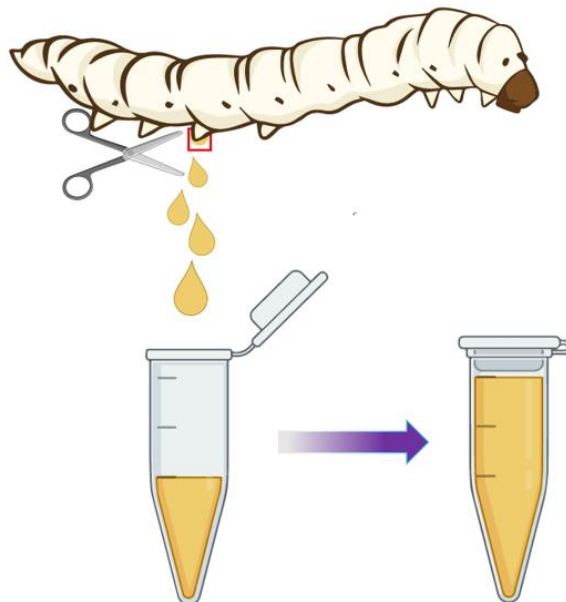
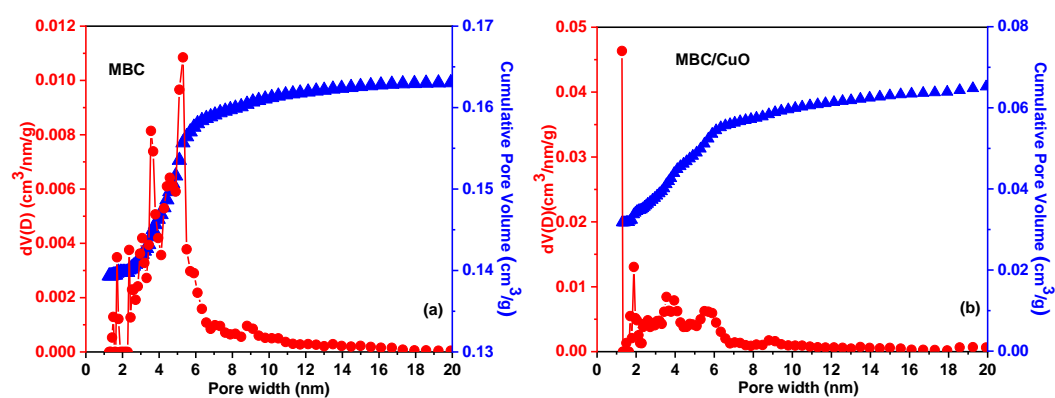


Figure S1. Schematic figure showing where the blood was collected from the silkworm's body, the samples of blood were collected at 48 h and 72 h.



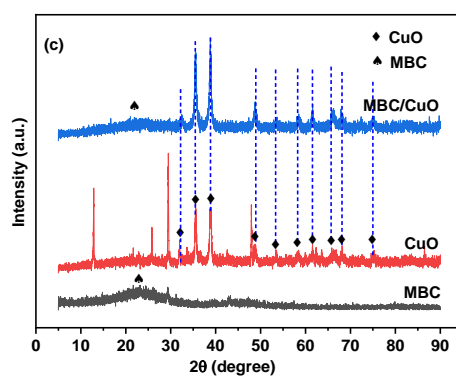


Figure S2. BJH pore size distribution of MBC (a) and MBC/CuO (b), as well as XRD patterns of MBC, CuO and MBC/CuO (c).

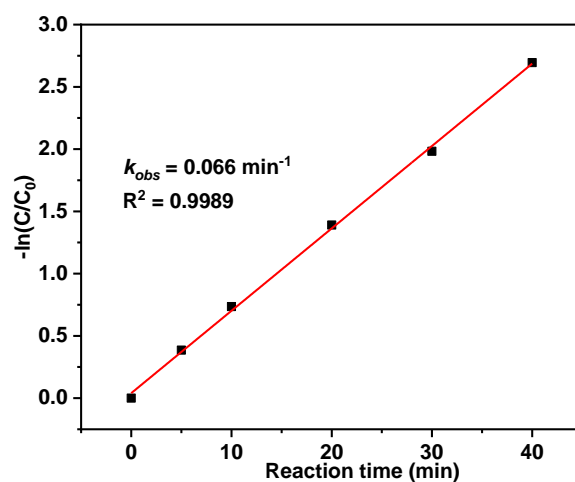
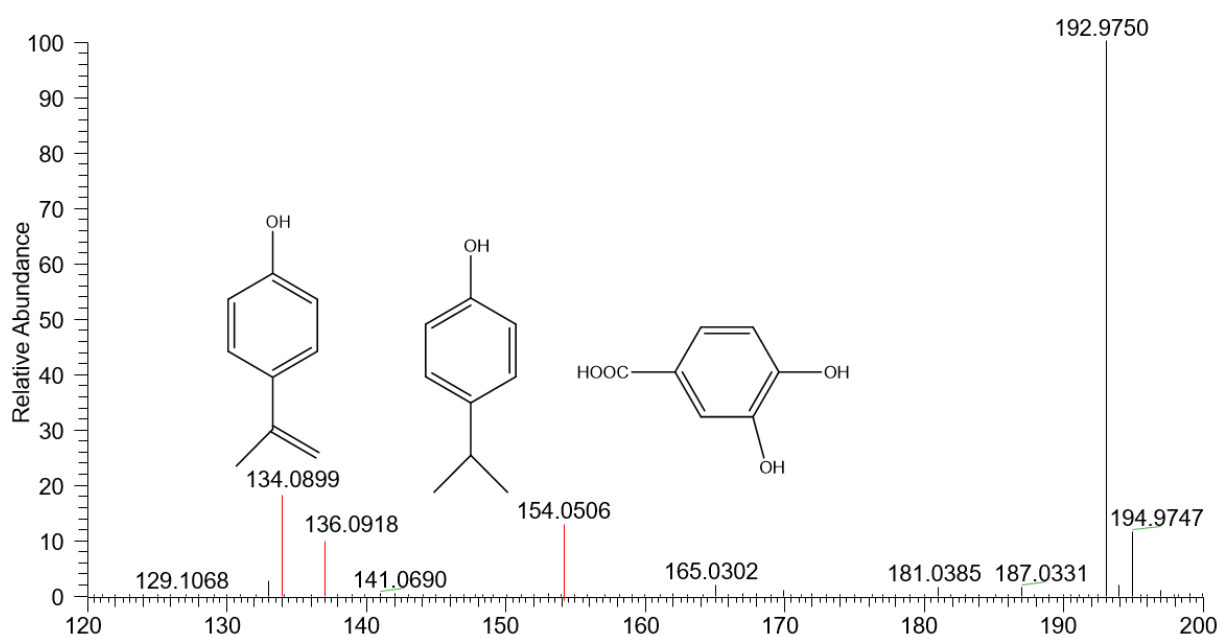


Figure S3. The pseudo-first-order rate of BPA degradation by MBC/CuO/PS system.



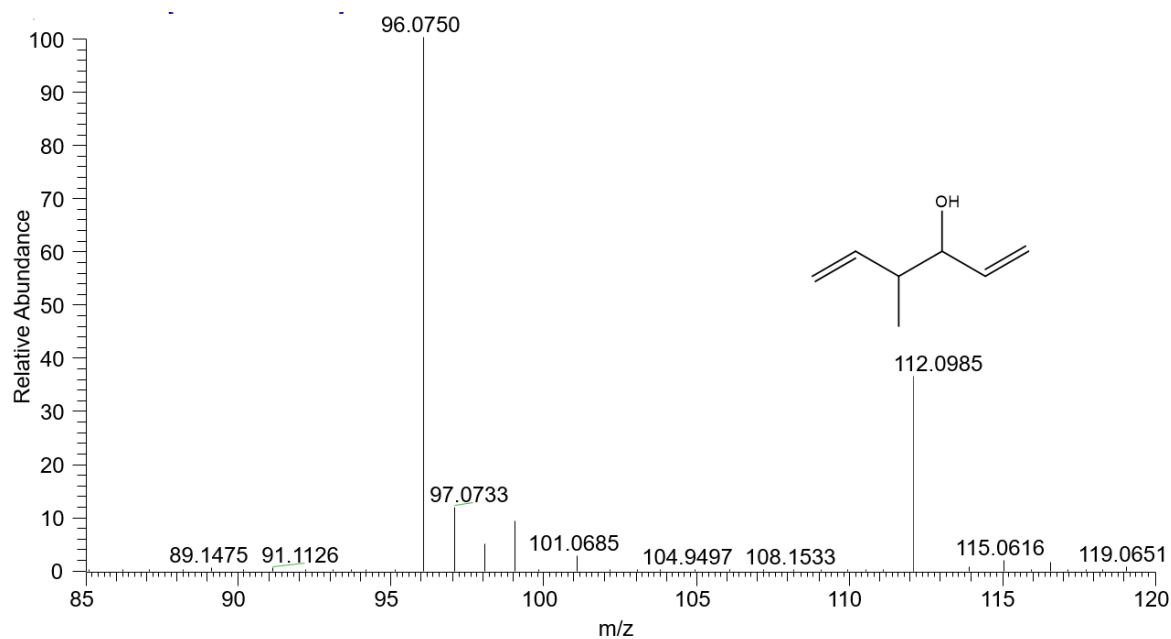
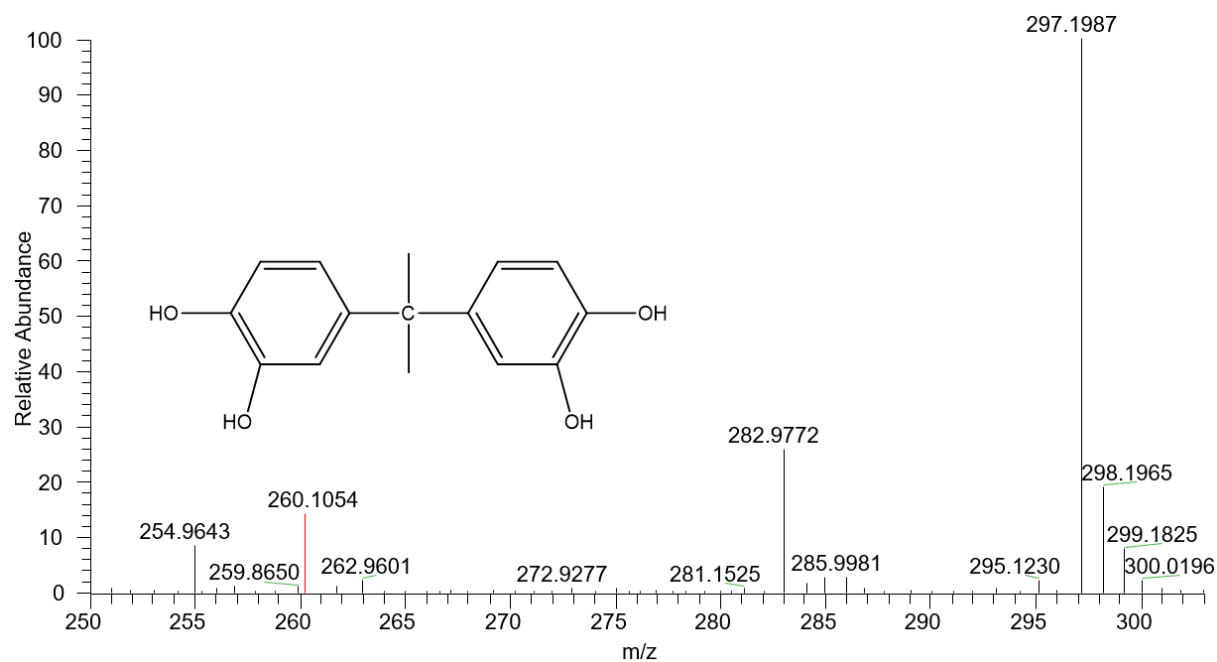


Figure S4. ESI mass spectra of various degraded products as determined by UPLC–MS.

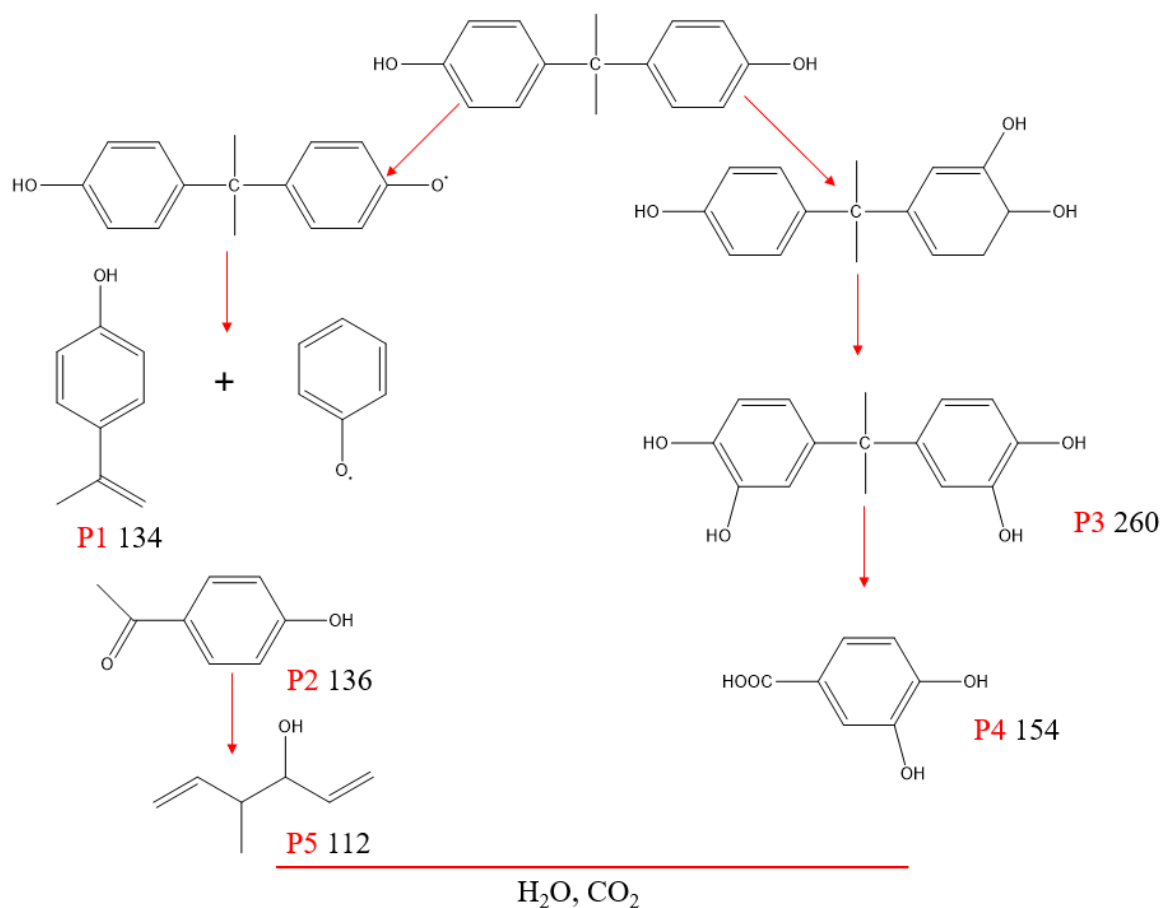


Figure S5. Possible BPA degradation pathways by in the MBC/CuO/PS system.

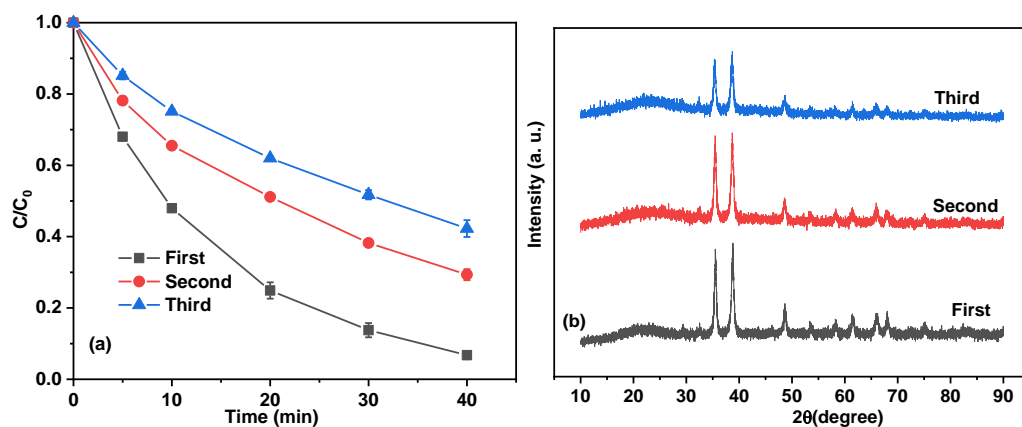


Figure S6. The reusability of MBC/CuO (a) and XRD patterns of reused MBC/CuO (b).

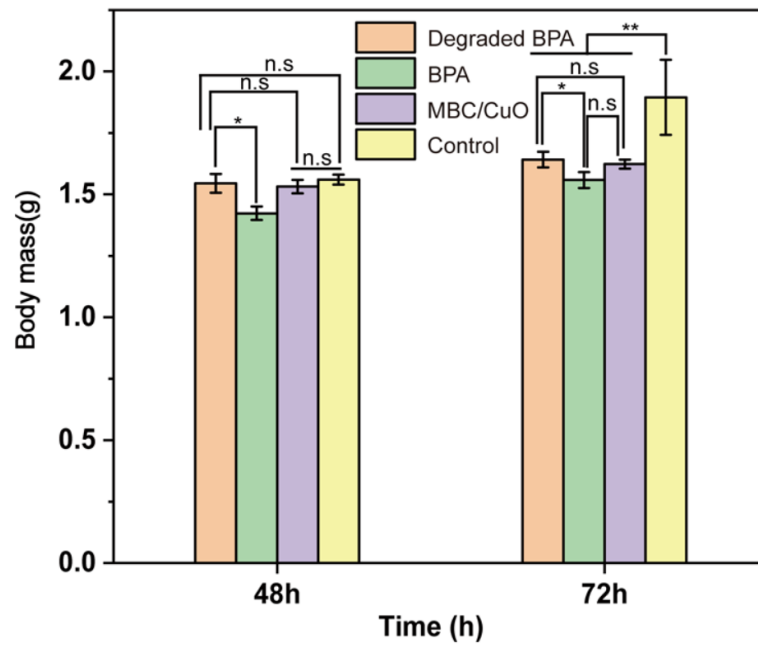


Figure S7. Body mass of the silkworms.



Figure S8. Pictures of silkworm larvae after the intake of degraded BPA, BPA , MBC/CuO, and water (control) for 96 h.

Table S1. qRT- PCR Primer Pairs.

Gene name	Sense primer (5'-3')	Antisense primer (5'-3')	Primer size(bp)
Caspase	CTGAGGCCGTGTGCAATTAT	CCTTCGTCTTCATTGCCGTT	124
Trt	ACATCTCCATTGCTGCTTAT	GGGTCACCGTCAGAATCAC	247
Dronc	CCTCGTGAACGGAAACGAAT	GGGCTGTTTGGATCAAGGTC	131
Bm-Actin3	CTTGGGTATGGAAGCCAACG	TGGTACCACCGACAATACG	113

Table S2. Specific surface areas and pore characteristics of samples.

Sample	BET Surface Area (m ² /g)	Pore volume (cm ³ /g)	Average pore size (nm)
BC	84.9	0.17	2.4
BC/CuO	82.9	0.079	3.8

Table S3. A comparison of BPA degradation between BC/CuO/PS system in this study and other systems reported in previous studies.

BPA concentrations	Catalysts concentrations	Oxidants concentrations	k_{obs} (min ⁻¹)	Removal efficiency (%)	Reaction time (min)	Ref.
0.1 mmol/L	CuFeO ₂ (1.0 g/L)	H ₂ O ₂ (20 mmol/L)	0.047	99.2	120	[69]
20 mg/L	Fe _{0.8} Co _{2.2} O ₄ (0.1 g/L)	PMS(0.2 g/L)	0.049	95	60	[70]
0.1 mmol/L	BC (0.1 g/L)	PMS (1.0 g/L)	0.022	46.26	60	[26]
0.1 mmol/L	BC/CuO (0.4g /L)	PS (4 mmol/L)	0.607	100	180	[71]
0.1 mmol/L	Fe ₃ O ₄ /BC (0.4 g/L)	PS (4.0 mmol/L)	0.0037	33.91	180	[71]
10 mg/L	BC/CuO (0.1 g/L)	PS (2.0 mmol/L)	0.066	93	40	This study

Table S4 The concentrations of the dissolved Cu²⁺ at different initial pH.

Initial pH	2.85	6.23	10.46
Leaching Cu ²⁺ (mg/L)	7.85	2.12	0.06

Table S5. The change of pH during the reaction.

Before reaction	After reaction
2.85	4.11
6.23	5.48
10.46	6.53

Table S6. Physical-chemical parameters of different waters used in this study.

Parameters	Ultrapure water	River water	Lake water	Tap water
pH	6.86	7.26	8.11	7.81
TOC (mg L ⁻¹)	n.d.	15.26	28.63	8.12
Cl ⁻ (mg L ⁻¹)	1.70	116.35	175.61	84.16
SO ₄ ²⁻ (mg L ⁻¹)	n.d.	16.32	72.06	35.08
NO ₃ ⁻ (mg L ⁻¹)	n.d.	0.77	8.45	2.69
HCO ₃ ⁻ (mg L ⁻¹)	n.d.	156.91	205.36	26.72
PO ₄ ³⁻ (mg L ⁻¹)	n.d.	1.12	2.33	n.d.

n.d.: Not detected.

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