Supplementary Information

Activation of peroxymonosulfate by distillers' grains biochar for the degradation of ciprofloxacin: Critical roles of singlet oxygen and electron transfer

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Text S1: SEM images were obtained by a scanning electron microscope (FE-SEM, ZEISS Sigma 300, Germany) armed with an EDS system. The crystallographic structure of the catalysts was characterized by X-ray diffraction (XRD) in the 2θ range of 10°-80° on a Rigaku Ultima IV diffractometer. The functional groups are presented on the surface of biochar were determined by FT-IR analysis (IRAffinity-1S, Shimadzu Corporation, Japan). Raman spectrum analysis was conducted to evaluate the degree of carbonization of biochar by using a Super LABRAM Raman spectrometer (Dilor, France)The specific surface area, pore volume and average pore width of the catalysts were analyzed by N_2 adsorption-desorption automatic specific surface area analyzer (ASAP 2460, Micromeritics, USA). Analysis of surface chemical information for the catalysts was performed by X-ray photoelectron spectrometry (XPS, Thermo Scientific ESCALAB 250Xi, USA). The formation of the radicals in the reaction was determinated by electron paramagnetic resonance spectroscopy (EPR, Bruker EMXPlus, Germany) using 5,5-dimethyl-1-pyrroline N-oxide (DMPO) and 2,2,6,6-tetramethyl-4-piperidone (TEMP) as the trapping reagents.

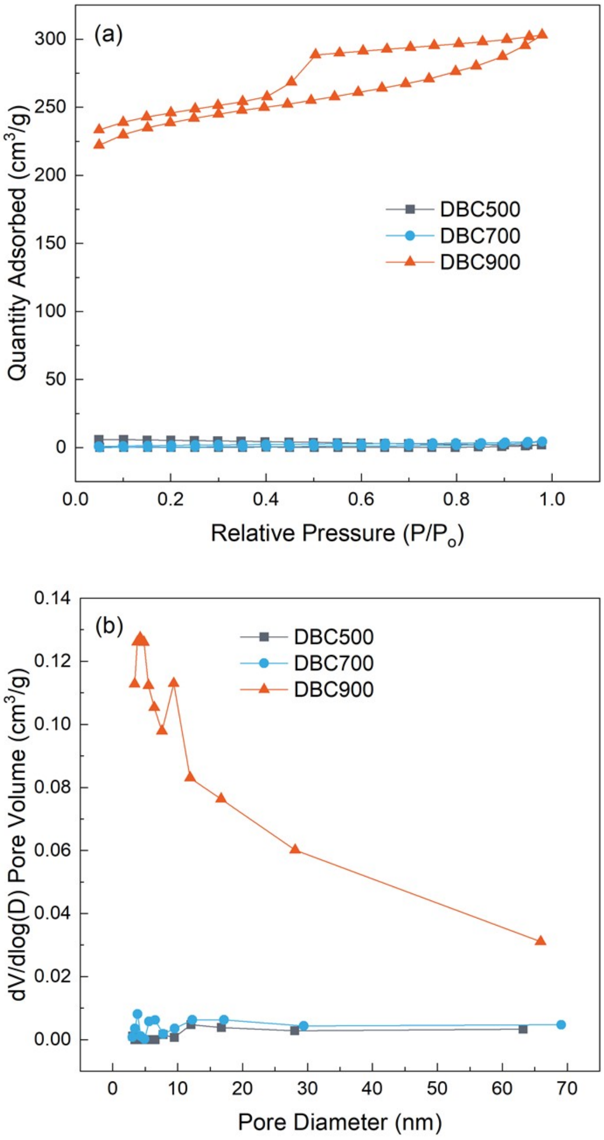


Fig. S1. The N_2 adsorption-desorption isotherms (a) and the corresponding pore size distributions (b) of DBC500, DBC700 and DBC900.

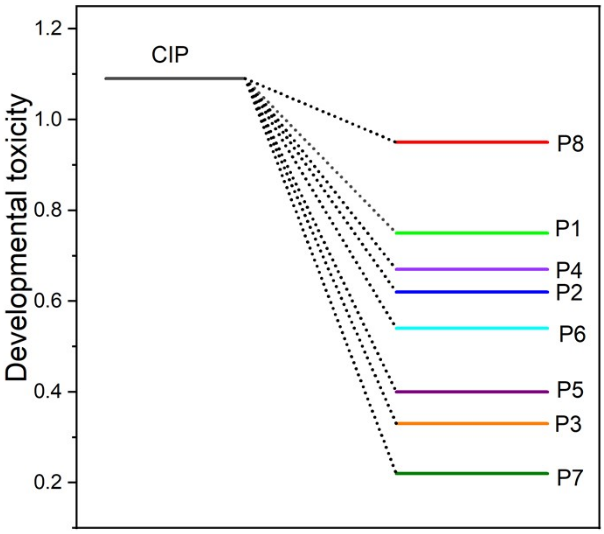
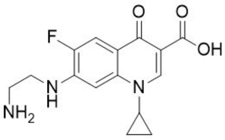
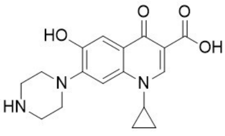
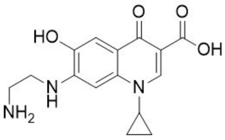
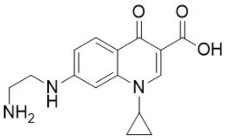
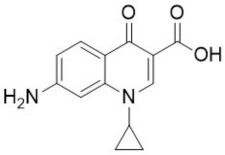
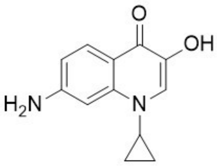
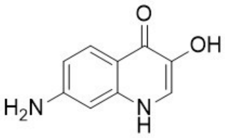
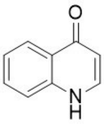


Fig. S2. The developmental toxicity of CIP and its intermediates.

Table S1 The parameters of different water bodies

Samples	pH	TOC (mg/L)	Cl^- (mg/L)
Ultrapure water	7.02	0.043	-
Tap water	7.16	0.854	0.076
River water	6.82	1.453	0.062

Table S2 Structures, retention times and molecular weight/charge (m/z) of the intermediates identified by LC-MS.

NO.	Proposed intermediates	Retention time (min)	m/z
P1		9.33	306
P2		13.12	330
P3		8.43	304
P4		6.32	288
P5		12.32	245
P6		11.57	218
P7		16.34	178
P8		17.88	146