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Supplementary Material for

Pyridine-functionalized iron phthalocyanine activates peroxymonosulfate for efficient catalytic degradation of carbamazepine

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Fig.S1. FTIR spectra of FePc, FePc-py-COCl powders.



Fig.S2. XRD patterns of FePc and FePc-py-COCl.



Fig.S3. Effects of different oxidant concentration on the degradation of CBZ by FePc-py-COC1. $[CBZ] = 2.5 \times 10^{-5} \text{ M}, [FePc-py-COC1] = 0.05 \text{ g/L}, \text{ T}=20 \text{ °C}, \text{ pH 7}.$



Fig.S4. Effects of different initial pH conditions on the degradation of CBZ by FePc-py-COC1. [CBZ] = 2.5×10^{-5} M, [PMS] = 0.8 mM, [FePc-py-COC1] = 0.05g/L,

T=20 °C, pH 7.



Fig.S5. FePc-py-COCl cyclic performance test.[CBZ] = 2.5×10^{-5} M, [FePc-py-COCl] = 0.05g/L, [PMS] = 0.8 mM, T=20 °C, pH 7.

Table S1. Degradation intermediates of CBZ $(2.5 \times 10^{-5} \text{ M})$ by FePc-py-COCl/PAN in the presence of PMS, examined by UPLC Synapt G2-S HDMS in positive ion mode after 210 min reaction time. [FePc-py-COCl] = 0.5 g/L, [PMS] = 0.8 mM, T = 20 °C, pH 7.

Compounds	$\begin{array}{c} m/z (Da) \\ (\Delta mDa) \end{array}$	Formula	Retention time (min)	Ion mode	Proposed structure
CBZ	237.1028 (0.3)	C15H13N2O	4.76	Positive	O NH2
A 1	(0.3)	C ₁₅ H ₁₀ N ₂ O ₃	3.42	Positive	

A 2	253.0977 (1.0)	$C_{15}H_{12}N_2O_2$	4.47	Positive	
A 3	269.0926 (2.6)	$C_{15}H_{12}N_2O_3$	3.31	Positive	O NH ₂
A 4	208.0762 (0.1)	C ₁₄ H ₉ NO	6.46	Positive	
A 5	224.0712 (0.4)	C ₁₄ H ₉ NO ₂	1.32	Positive	
A 6	267.0770 (0.5)	$C_{15}H_{10}N_2O_3$	1.19	Positive	
A 7	180.0815 (0.4)	C ₁₃ H ₁₀ N	5.91	Positive	
A 8	196.0762 (0.8)	C ₁₃ H ₉ NO	4.79	Positive	O L L L H

Table S2. Oxidative intermediates of CBZ $(2.5 \times 10^{-5} \text{ M})$ by FePc-py-COCl/PAN in the presence of PMS in the dark, examined by UPLC Synapt G2-S HDMS in negative ion mode after 4 h reaction time. [FePc-py-COCl] = 0.5 g/L, [PMS] = 0.8 mM, T = 20 °C, pH 7.

Compounds	m/z (Da) (ΔmDa)	Formula	Retention time (min)	Ion mode	Proposed structure
F 1	191.0179 (0.3)	$C_6H_8O_7$	7.58	Negative	о ^О ОН НО ОН ОН

F 2	133.0137 (0.5)	$C_4H_6O_5$	1.39	Negative	о он но он он
F 3	149.0086 (0.6)	$C_4H_6O_6$	0.97	Negative	о он но — он он о
F 4	145.0501 (0.3)	$C_{6}H_{10}O_{4}$	4.90	Negative	о но он
P 5	(6.5)	C4H4O4	1.76	Negative	н н ноос соон

Analytical methods

X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS) were used to study samples chemical structures. XRD were performed using a Bruker D8 Discover X-ray diffractometer with Cu Ka as radiation source. FTIR spectra were collected by using a Thermo Nicolet 5700 FTIR spectro-meter. XPS was carried out on a Thermo Scientific K-Alpha spectro-meter with monochromatic light source (Al Ka, 1486.6 eV). UV–vis diffuse reflection spectra (DRS) was measured by UV–vis spectrometer (Hitachi, 1J1-0015). EPR signals of radicals trapped by DMPO and TEMP were detected in a Bruker A300 spectrometer at ambient temperature. The degradation intermediates of CBZ in the FePc-py-COCl/PMS system were identified by UPLC HDMS (Waters,USA).