Supporting Information

Table S1 Concentrations of individual PAHs in the contaminated soil used in the present study

		Initial concentration (mg/kg)	Chinese standard[a]
2-ring	Nap	28.5	≤5.0 mg/kg
3-ring	Any	15.6	≤5.0 mg/kg
	Ane	18.2	≤5.0 mg/kg
	Fle	14.3	≤5.0 mg/kg
	Phe	37.3	≤5.0 mg/kg
	Ant	46.5	≤5.0 mg/kg
4-ring	Fla	53.8	≤5.0 mg/kg
	Pyr	34.4	≤5.0 mg/kg
	BaA	22.2	≤5.0 mg/kg
	Chr	28.5	≤5.0 mg/kg
5-ring	BbF	39.6	≤5.0 mg/kg
	BkF	11.3	≤1.0 mg/kg
	BaP	4.6	≤0.5 mg/kg
	DahA	12.4	≤0.5 mg/kg
6-ring	IcdP	4.6	≤0.5 mg/kg
	BghiP	8.2	≤5.0 mg/kg
	∑ 16PAHs	380	

[a]Chinese soil quality standard for residential use (GB15618-2008). The sample was analyzed for a total of 16 US EPA priority PAHs. Abbreviation: Nap, naphthalene; Any, acenaphthylene; Ane, acenaphthene; Fle, fluorene; Phe, phenanthrene; Ant, anthracene; Fla, fluoranthene; Pyr, pyrene; BaA, benz[a]anthracene; Chr, chrysene; BbF, benzo[b]fluoranthene; BkF, benzo[k]fluoranthene; BaP, benzo[a]pyrene; DahA, dibenz[a,h]anthracene; IcdP, indeno[1,2,3-cd]pyrene; BghiP, benzo[g,h,i]perylene; SP, sodium persulfate; CA, citric acid; HPCD, hydroxypropyl-β-cyclodextrin.

Table S2 Concentrations of individual PCB congeners in the contaminated soil used in the present study

	Congeners	Initial concentration (mg/kg)
Tri-PCB	PCB-18	1.7
	PCB-28	3.3
Tetra-PCB	PCB-44	14.5
	PCB-52	26.8
	PCB-66	34.2
	PCB-77	23.3
Penta-PCB	PCB-101	14.6
	PCB-105	17.3
	PCB-118	11.3
	PCB-123	7.8
	PCB-126	5.4
Hexa-PCB	PCB-138	4.6
	PCB-153	3.2
	PCB-156	2.5
	PCB-167	1.7
Hepta- to nona-PCB	PCB-170	1.1
	PCB-180	0.85
	PCB-200	0.65
	PCB-206	0.53
	∑6 indicator PCBs	63.8
	∑ 19PCBs	175

The sample was analyzed for a total of 19 PCB congeners, including 6 indicator PCBs (PCB-28, -52, -101, -118, -138, -153). PCB-209 was not detected.

Table S3 Concentrations of individual PBDE congeners in the contaminated soil used in the present study

	Congeners	Initial concentration (mg/kg)
Di-BDE	BDE-15	9.4
Tri-BDE	BDE -28	12.6
Tetra-BDE	BDE-47	7.3
	BDE-99	18.6
Penta-BDE	BDE-99	7.5
	BDE-100	9.3
Hexa-BDE	BDE-153	3.5
	BDE-154	6.3
Hepta-BDE	BDE-183	3.2
Octa-BDE	BDE-203	7.8
Nona-BDE	BDE-207	2.4
Deca-BDE	BDE-209	36.3
	∑ 12BDEs	124

The sample was analyzed for a total of 12 BDE congeners.

Table S4 The abiotic loss of POPs in the abiotic control test after 30 days of treatment

	Initial concentration (mg/kg)	Final concentration (mg/kg)	Loss (%)
PAHs	380	325	14.5
PCBs	175	136	22.3
PBDEs	124	98	21.0
Sum	679	559	17.6

Analytical methods:

1. Sample cleanup and PAHs quantification

The soil samples were air-dried, spiked with deuterated surrogate standards (fluorene-d10, anthracene-d10, pyrene-d10, benzo[a]pyrene-d12), and then mixed with anhydrous magnesium sulfate for extraction. An appropriate amount of activated copper powder was also added to each extraction cell in order to remove sulfur during the extraction. Samples were extracted three times under the conditions: oven temperature, 100 °C; pressure, 1700 psi; heat time, 5 min; static time,

10 min; flush, 60%. The three extracts were pooled, concentrated with a rotary evaporator, and solvent exchanged with 5 mL of n-hexane.

Sample cleanup was conducted on a silica gel–aluminum oxide column (10 cm × 6 mm ID). Elution was conducted by successively loading 5 mL n-hexane and 20 mL n-hexane–dichloromethane (3:7, v/v) and the second part of the elution was collected for PAH determination. The elution was concentrated and solvent exchanged to 1 mL of hexane containing 200 μg/L hexamethyl benzene and perylene-d12 as internal standards. The final extract was sealed and kept at −4 °C until analysis.

PAHs quantification was conducted using an Agilent 7890–5975c gas chromatography–mass spectrometer (GC–MS). A DB-5 column (30 m × 0.25 mm × 0.10 μm) was used. The injection volume was 1 μL. Helium was used as the carrier gas at a flow rate of 1 mL/min. The column temperature was set to 50 °C for the first 1 min, increased 20 °C/min to a temperature of 120 °C, then increased 4 °C/min to 310 °C, and maintained at 310 °C for 30 min. Mass spectrometer conditions were: electron impact, electron energy 70 eV; filament current 100 μA; multiplier voltage, 1200 V; full scan. Quantification of individual PAHs was performed in MS/MS scan mode at normal speed, based both on retention time and characteristic ions. Concentrations of each PAH were finally calculated and calibrated using the standard calibration curve.

2. Sample cleanup and PBDEs quantification

The extraction, cleanup procedures and quantification methods of PBDEs are identical to that of PAHs, only with some differences in surrogate standards, namely ^{13}C-PCB-30 and ^{13}C-PCB-209 were used as surrogate standards, while ^{13}C-BDE-77 was added to the elute as an internal standard.

3. Sample cleanup and PCBs quantification

The extraction, cleanup procedures and quantification methods of PCBs are identical to that of PAHs, only with some differences in surrogate standards, namely ^{13}C-PCB-209 was used as surrogate standard, while ^{13}C-PCB-30 was added to the elute as an internal standard.

For solution samples, the solution was extracted three times by liquid-liquid using separating funnels, while other procedures are identical to that for soil samples.

4. Metal fractionation

(1) 10 mL of 1.0 M $MgCl_2$, extracting the water soluble and exchangeable fraction (F1); (2) 10 mL of 1.0 M CH_3COONa (adjusted to pH 5.0 with addition of acetic acid), extracting the fraction bound to carbonates (F2); (3) 20.0 mL of 0.04 M $NH_2OH{\cdot}HCl$ dissolved in 25% (v/v) acetic acid, extracting the fraction bound to Fe-Mn oxides (F3); (4) first 3.0 mL of 0.02 M HNO_3 and 5.0 mL of 30% (v/v) H_2O_2 (adjusted to pH 2.0 with HNO_3), then 3.0 mL of 30% (v/v) H_2O_2 (pH 2.0), followed by 5.0 mL of 3.2 M CH_3COONH_4 in 20% (v/v) HNO_3, extracting the fraction bound to organic matter (F4); and (5) 20 mL of acid mixture ($HCl:HNO_3:H_2SO_4$=1:2:4), extracting the residual fraction (F5).