Supplementray Information

The role of soil components on the sorption of tetracycline and heavy metal on soils

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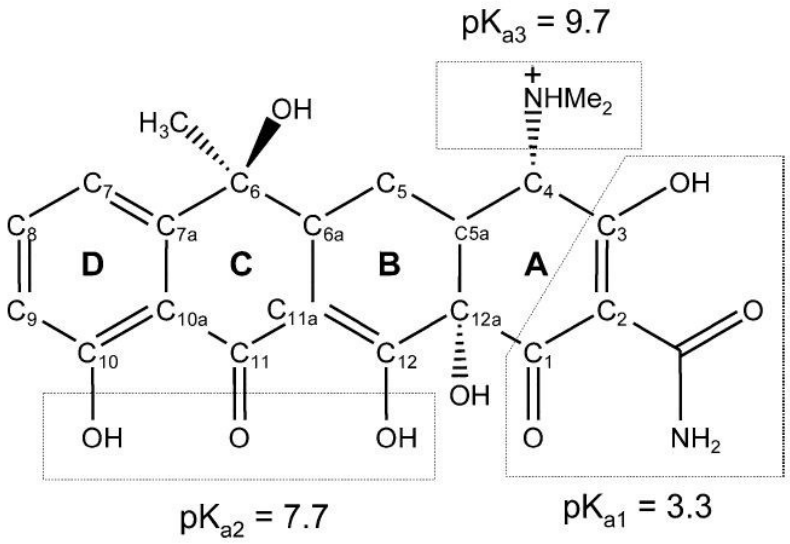
- Number of figures: 2

Table S1 Molecular structure and physic-chemical properties of tetracycline (TC).

Molecular structure	
Molecular formula	$C_{22}H_{24}N_2O_8$
Molar weight (g mol^{-1})	444.43
Water solubility (mg L^{-1})	1700
pK_a[a]	3.3, 7.7, 9.7
log K_{ow}[b]	-1.19
Melting point (℃)	214

[a]pK_a, dissociation constant; [b]logK_{ow}, octanol-water partition coefficient.

Table S2 Freundlich parameters of TC sorption isotherms on BS, ROM, ROX and HA in the absence and presence of 4 mg L^{-1} Cu^{2+} or Cd^{2+} and single-point sorption coefficients at three initial concentrations of C_{e1} = 5 mg L^{-1}, C_{e2} = 15 mg L^{-1}, C_{e3} = 25 mg L^{-1}.

Sorbents	Cu or Cd (mg L^{-1})	K_f ($mg^{(1-n)}$ L^n g^{-1})	n	R^2	K_d (L g^{-1}) at C_e (mg L^{-1})		
					C_{e1}	C_{e2}	C_{e3}
BS	0	6.53	0.43	0.999	5.82	2.1	1.44
	Cu= 4	17.08	0.36	0.991	52.8	10.75	5.14
	Cd =4	6.4	0.44	0.995	5.56	1.94	1.45
ROM	0	19.69	0.34	0.993	26.15	6.2	3.45
	Cu = 4	40.19	0.29	0.992	—	35.62	10.7
	Cd = 4	17.94	0.35	0.995	21.98	5.74	3.24
ROX	0	32.56	0.36	0.991	93.69	18.27	8.44
	Cu = 4	60.55	0.24	0.995	—	127.93	26.29
	Cd= 4	29.85	0.33	0.994	66.14	13.25	6.5
HA	0	74.12	0.36	0.983	—	115.34	51
	Cu = 4	61.82	0.44	0.998	257.89	116.24	42.91
	Cd = 4	59.68	0.51	0.992	148.02	93.98	42.26

Table S3 Freundlich parameters of Cu^{2+} and Cd^{2+} sorption isotherms on BS, ROM, ROX and HA and single-point sorption coefficients at three initial concentrations of C_{e1} = 2 mg L^{-1}, C_{e2} = 8 mg L^{-1}, C_{e3} = 20 mg L^{-1}.

	Sorbents	K_f ($mg^{(1-n)}$ L^n g^{-1})	n	R^2	K_d (L g^{-1}) at C_e (mg L^{-1})		
					C_{e1}	C_{e2}	C_{e3}
Cu^{2+}	BS	2.85	0.40	0.993	2.22	0.94	0.50
	ROM	2.13	0.45	0.995	1.99	0.83	0.45
	ROX	4.28	0.57	0.993	4.33	2.61	1.45
	HA	8.56	0.38	0.992	22.05	5.87	2.01
Cd^{2+}	BS	2.89	0.34	0.993	2.77	0.85	0.42
	ROM	1.74	0.43	0.995	1.76	0.64	0.35
	ROX	2.55	0.67	0.996	2.53	1.45	1.06
	HA	6.16	0.44	0.990	12.44	3.51	1.56

Figure captions

Fig S1 The interrelations of organic matter, metal oxide and clay among black soil (BS), removed organic matter (ROM), removed metal oxide (ROX) and humic acid (HA).

Fig S2 Zeta potential of the black soil (BS), removed organic matter (ROM), removed metal oxide (ROX) and humic acid (HA) suspension at different pH.

Fig S1 The interrelations of organic matter, metal oxide and clay among black soil (BS), removed organic matter (ROM), removed metal oxide (ROX) and humic acid (HA).

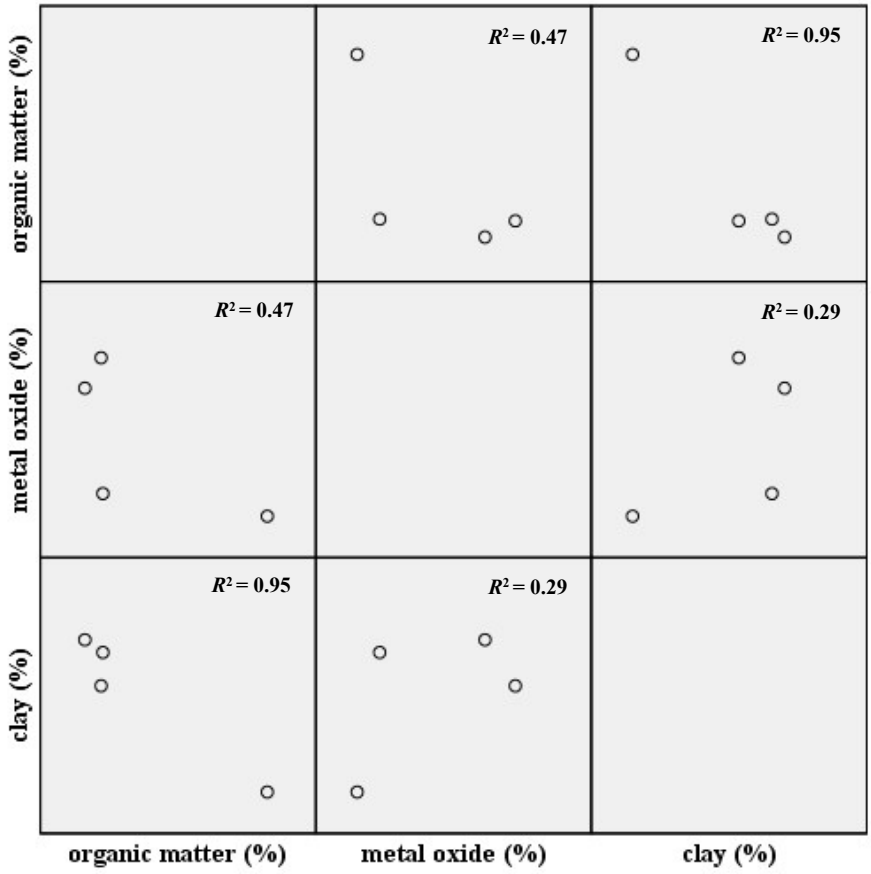
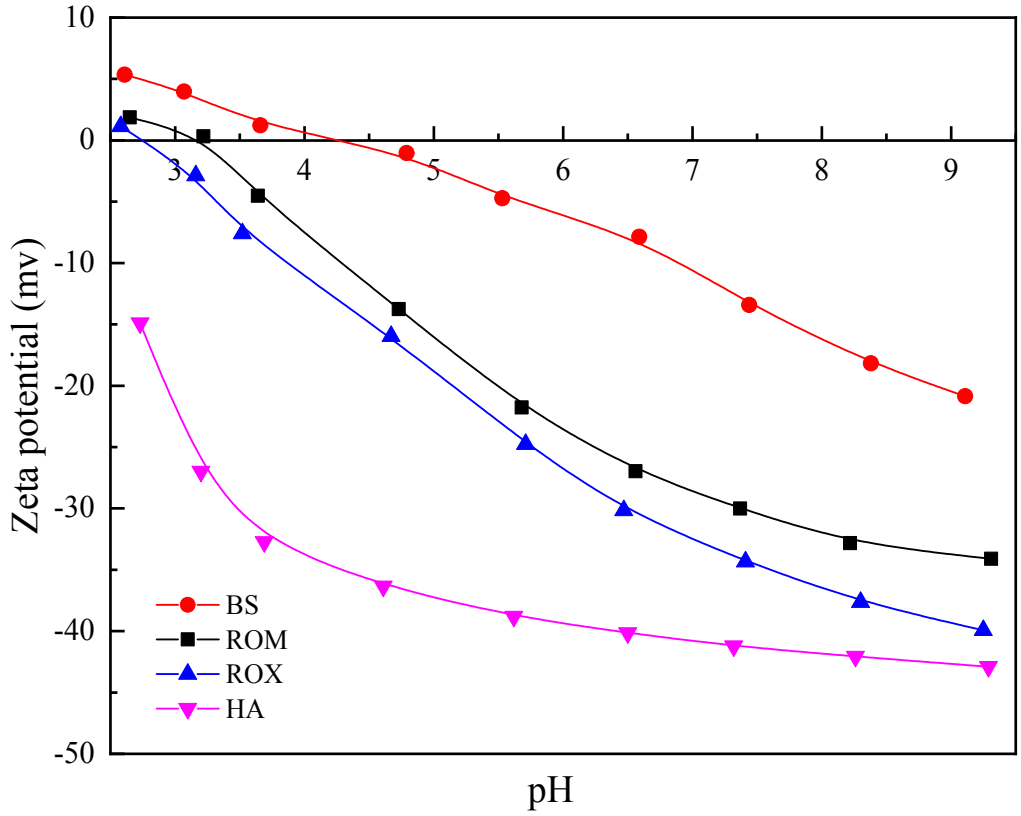


Fig S2 Zeta potential of the black soil (BS), removed organic matter (ROM), removed metal oxide (ROX) and humic acid (HA) suspension at different pH.



Preparation methods of removed organic matter (ROM), removed metal oxide (ROX) and humic acid (HA).

80 g of BS was placed in a 500 mL beaker. A certain amount of water and 10 mL of 30% H_2O_2 were added. The suspension was placed in a water bath at 70℃-80℃. When the reaction had subsided, the treatment was repeated until no further reaction by the addition of more H_2O_2. The supernatant was decanted and the precipitate was rinsed three times with deionized water, air-dried and was labeled as ROM.

2 g of BS was placed in a 100 mL centrifuge tube containing 40 mL of 0.3 M Na-citrate solution and 5 mL of 1 M $NaHCO_3$ solution. The temperature was brought to 80℃ in a water bath, then 1 g of solid $Na_2S_2O_4$ was added and the mixture was stirred several times and centrifuged for 5 min at 3500 r/min. The precipitate was rinsed three times with 0.01 M NaCl, air-dried and was labeled as ROX.

HA was progressively extracted seven times in a 1000 mL beaker containing a certain of BS and 0.1 M $Na_4P_2O_7$ solution at a solid to solution ratio of 10:1 (v/w). Then the supernatant after centrifugation of the mixture at 3500 r/min was acidified to pH = 1.5–2 with 1 M HCl to obtain the first HA_1 fraction. Finally, all the seven HA fractions were collected as HA, and then rinsed with deionized water, freeze-dried and ground for use.