Supplementary Materials for:

Activated carbons derived from hydrothermal impregnation of sucrose with phosphoric acid: remarkable adsorbents for sulfamethoxazole removal

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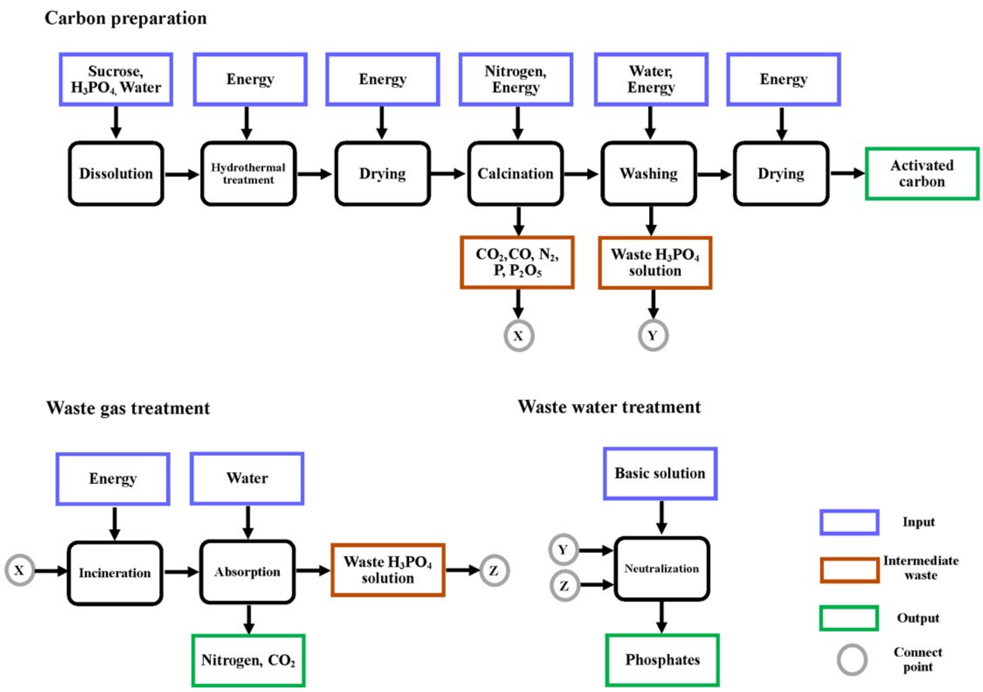

Figure S1 Cradle-to-gate scheme of the activated carbon

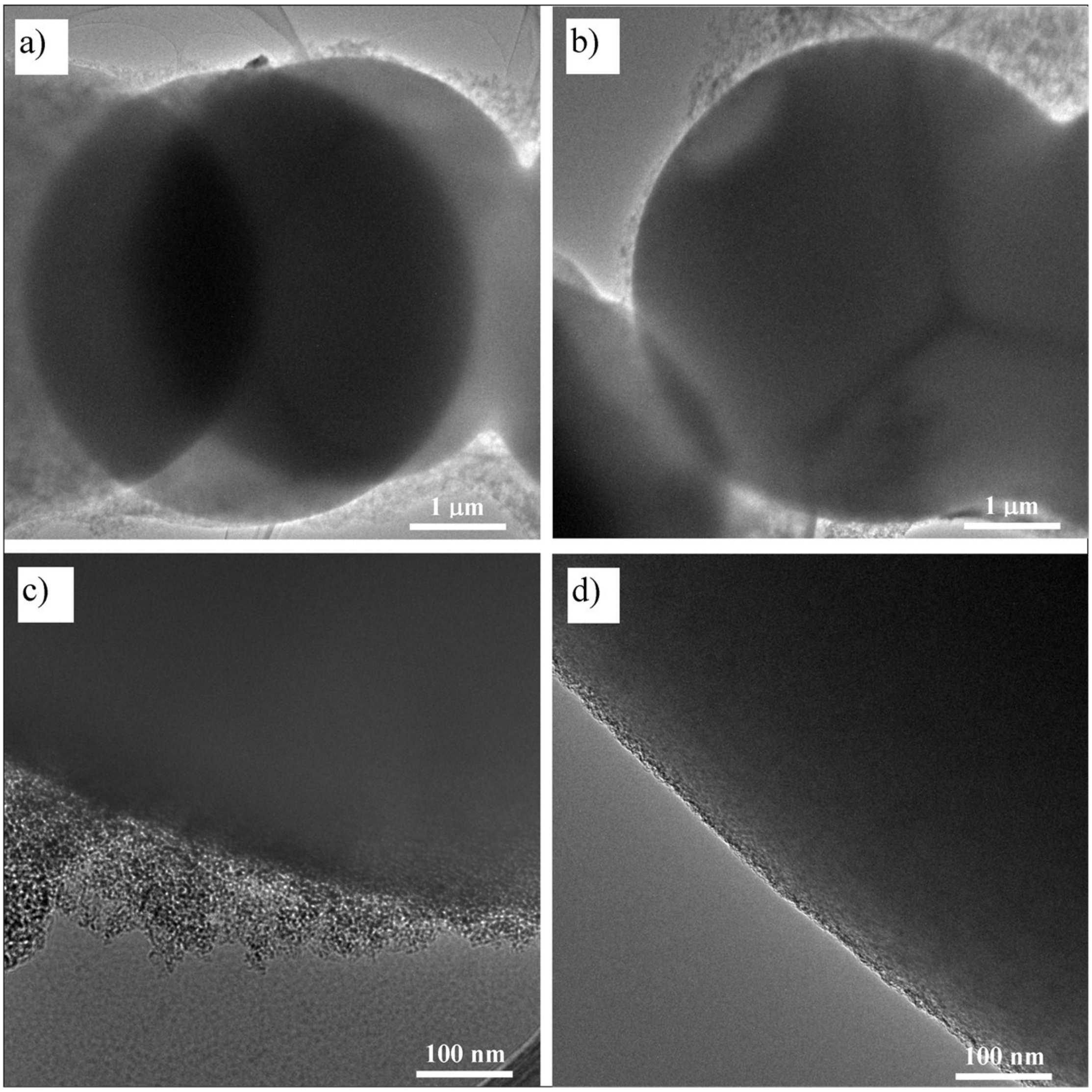

Figure S2 TEM images of C-900

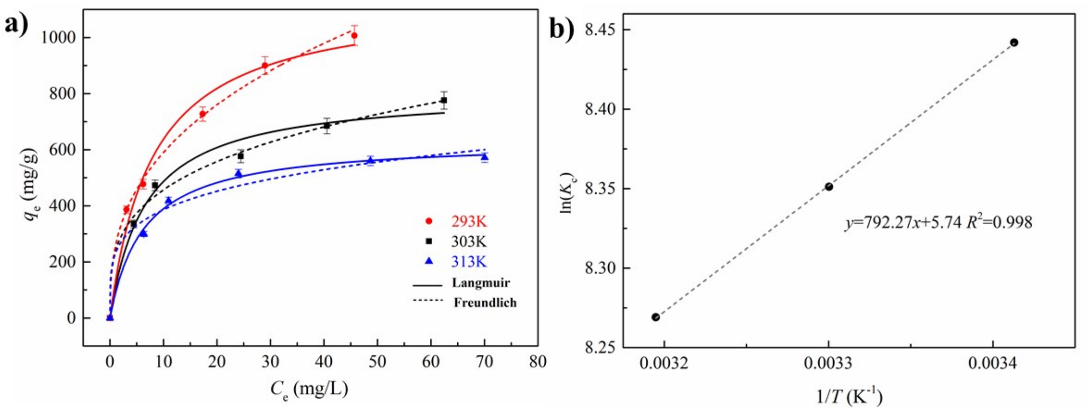

Figure S3 Effect of adsorption temperature: adsorption isotherms (a); fitting in van't Hoff equation (b).

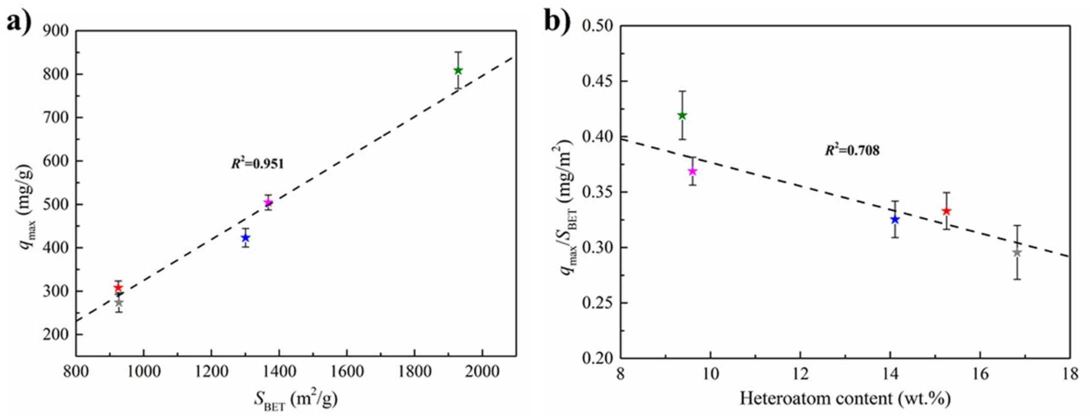

Figure S4 Effects of S_{BET} (a) and heteroatom content (b) on SMX adsorption amounts.

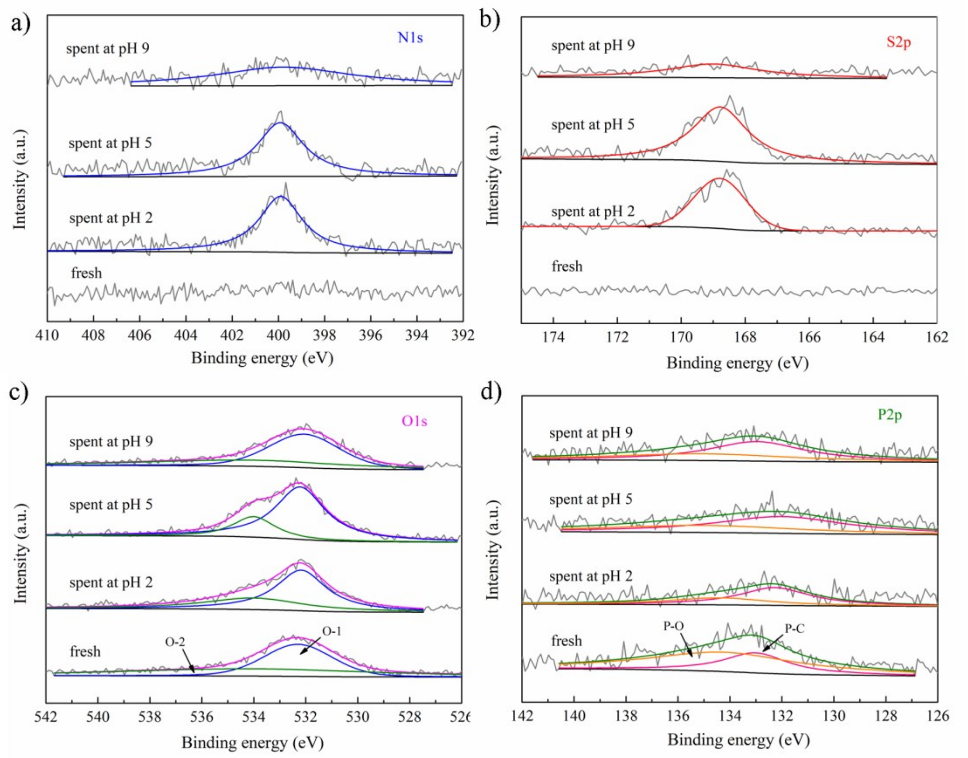

Figure S5 Deconvolution of the high-resolution N1s (a), S2p (b), O1s (c) and P2p (d) spectra

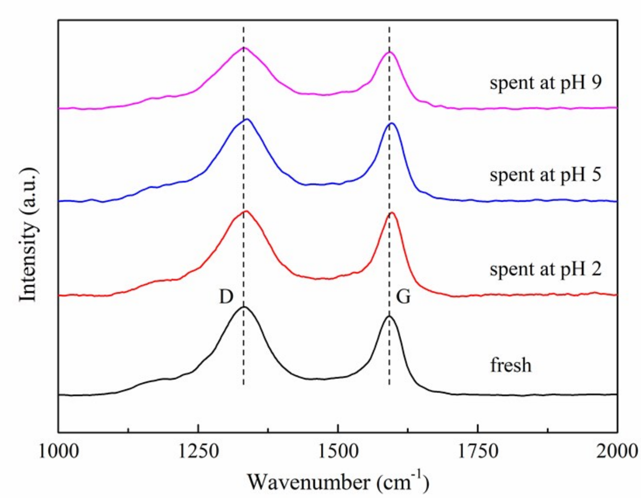

Figure S6 Raman spectra of fresh and spent C-900

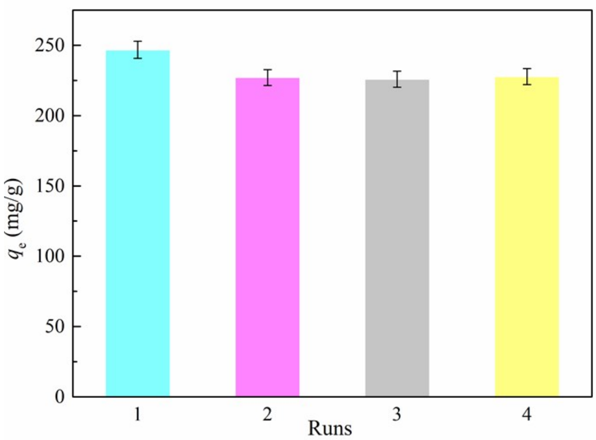

Figure S7 Regeneration performance of C-900

Table S1 Pseudo-first-order and pseudo-second-order models for SMX adsorption

Adsorbents	Exp. q_e (mg/g)	Pseudo-first-order model			Pseudo-second-order model			
		Cal. q_e (mg/g)	k_1 (10^{-2}min^{-1})	R^2	Cal. q_e (mg/g)	k_2 (10^{-4}g/(mg·min))	R^2	h (mg/(g·min))
C-500	146.3	137.6	2.193	0.957	147.4	2.113	0.989	4.59
C-600	163.7	151.3	4.368	0.926	159.6	4.252	0.981	10.83
C-700	212.7	203.9	6.291	0.965	212.1	5.324	0.994	23.95
C-800	223.3	214.7	6.821	0.947	223.1	5.618	0.986	27.96
C-900	247.6	238.0	9.153	0.974	245.3	7.860	0.997	47.29

Table S2 The intra-particle diffusion constants for SMX adsorption

Adsorbents	k_1 (mg·g^{-1}min$^{-0.5}$)	C_1 (mg/g)	R_1^2	k_2 (mg·g^{-1}min$^{-0.5}$)	C_2 (mg/g)	R_2^2	k_3 (mg·g^{-1}min$^{-0.5}$)	C_3 (mg/g)	R_3^2
C-500	9.127	17.9	0.907	2.422	86.0	0.916	-0.018	146.9	0.664
C-600	6.087	69.5	0.918	1.777	115.0	0.847	0.287	150.9	0.102
C-700	7.379	115.5	0.872	1.732	174.0	0.741	0.037	209.9	0.752
C-800	7.441	127.3	0.956	1.105	198.6	0.964	-0.074	226.8	0.209
C-900	6.827	164.0	0.994	0.691	228.4	0.684	0.073	243.8	0.935

Table S3 Isotherm models for SMX adsorption on C-900 at different temperatures

Temperature (K)	Langmuir model			Freundlich model		
	q_{max} (mg/g)	K_L (L/mg)	R^2	K_F ((mg/g)(L/mg)$^{1/n}$)	n	R^2
293	1142.7	0.1261	0.983	254.5	2.737	0.997
303	808.7	0.1510	0.980	235.3	3.470	0.992
313	633.8	0.1591	0.996	229.3	4.415	0.970

Table S4 Elemental compositions of fresh and spent C-900 determined by XPS

Sample	C[a]	O[a]	P[a]	N[a]	S[a]	O/C	N/S
fresh	96.74	2.7	0.56	—	—	0.028	—
spent at pH 2	93.07	3.53	0.27	2.25	0.88	0.038	2.6
spent at pH 5	92.08	4.06	0.32	2.54	1.00	0.044	2.5
spent at pH 9	95.67	2.6	0.6	0.80	0.33	0.027	2.4

[a] atom percentage, %.

[b] not detected

Table S5 Peak positions in the Raman spectrum of fresh and spent C-900

Sample	D band position (cm^{-1})	G band position (cm^{-1})
fresh	1329	1590
spent at pH 2	1332	1593
spent at pH 5	1332	1592
spent at pH 9	1329	1590

Table S6 Comparison of SMX adsorption capacity

Adsorbent	Temperature (°C)	C_0 (mg/L)	pH	Adsorption capacity (mg/g)	Ref*.
sulfonic acid functionalized carbon	25	100~400	4.0	426	[1]
graphene oxide	room temperature	4~40	5.0	240	[2]
commercial activated carbon	25	100	3.0	110	[3]
ZIF-8-derived carbon obtained at 1000°C	25	100	3.0	435	[3]
carbon nanotubes	20	10~100	5.8	484	[4]
MOF-5-derived carbon obtained at 1000°C	20	10~100	5.8	625	[4]
H_3PO_4 functionalized biochar	30	0.5~50	3.3	82	[5]
C-900	30	20~100	5.0	809	This work

References

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