Supporting Information

Novel mesoporous amorphous B-N-O-H nanofoam as electrode for capacitive dye removal from water

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Summary: 72 Pages; 40 Tables; 32 Figures

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Table S1 Textural properties of mesoporous B-N-O-H nanofoams and their mother mesoporous CuB_{23} templates.

Samples	d_{100} / nm	a_0 / nm		S_{BET} / m^2g^{-1}	Pore size / nm		Wall thickness / nm		Pore volume / cm^3g^{-1}
CuB_{23}	4.38*	5.05 [a]	5.11 [b]	645	2.0 [c]	2.0 [e]	3.1 [f]	3.1 [g]	1.58
B-N-O-H nanofoams	5.81*	6.71 [a]	6.22 [b]	1023	3.7 [d]	3.7 [e]	2.5 [f]	2.5 [g]	3.53

Note: *d_{100} spacing values were calculated from the Bragg equation (1) : $2\times d_{100} = \lambda / \sin\theta_{100}$, $\lambda = 0.15418$ nm;

[a] Cell parameters (a_0) were calculated from the cell parameters equation (2) for hexagonal system: $a_0 = 2\times d_{100}/ (3)^{1/2}$;

[b] Cell parameters (a_0) were the distance between the centers of two neighboring nanowires by STEM averaged from 300 couples;

[c] Pore diameters obtained from pore size distribution;

[d] Pore diameters averaged from pore size distribution via equation (3): Average pore diameter = Average pore diameter of pore 1 × the ratio of pore 1 + Average pore diameter of pore 2 × (1- the ratio of pore 1);

[e] Pore diameters obtained by STEM averaged from 300 pores;

[f] Wall thickness calculated from the wall thickness equation (4) for hexagonal system: Wall thickness = a_0 – pore size

[g] Wall thickness obtained by STEM averaged from 300 points.

Table S2 Elemental analysis of N and H in B-N-O-H obtained using NH_4Cl and ^{15}N and ^{2}H labeled $^{15}N^{2}H_4Cl$ as precursors, respectively.

Samples	**H/ %**	**N/%**	**^{2}H/%**	**^{15}N/%**
B-N-O-H obtained using NH_4Cl obtained using NH_4Cl as precursors	1.076	28.382	-	-
B-N-O-H obtained using NH_4Cl obtained using $^{15}N^{2}H_4Cl$ as precursors	-	-	2.087	29.480

Table S3 The effect of reaction parameters, including plasma power, reaction temperature, reaction time, NH_4Cl amounts, Ionic liquids (Ils) volume, Ils kinds, O_2 rate on the yield, specific surface areas, average pore diameters and atom composition of B-N-O-H nanofoams prepared with SPT.

Samples	**Reaction temperature / °C**	**Reaction time / min**	**Plasma power / W**	**NH_4Cl / mmol** [a]	**Ils volume / mL**	**Ils kinds**	**O_2 rate / $mLmin^{-1}$**	**Yield / %**	**Specific surface areas / m^2g^{-1}**	**Pore distribution**[b]	**Average pore diameters / nm** [c]	**Atom composition**
1	55	5	20	1.87	30	[BMIM][PF_6]	10	100	648	2.2×0.11+5.3×0.89	5.0[c] (5.0)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
2	45	5	20	1.87	30	[BMIM][PF_6]	10	100	806	2.2×0.30+5.3×0.70	4.4[c] (4.4)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
3	35	5	20	1.87	30	[BMIM][PF_6]	10	100	900	2.2×0.42+5.3×0.58	4.0[c] (4.0)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
4	25	5	20	1.87	30	[BMIM][PF_6]	10	100	1023	2.2×0.52+5.3×0.48	3.7[c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
5	15	5	20	1.87	30	[BMIM][PF_6]	10	82.7	1023	2.2×0.52+5.3×0.48	3.7[c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
6	5	5	20	1.87	30	[BMIM][PF_6]	10	50.3	1023	2.2×0.52+5.3×0.48	3.7[c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
7	25	0.5	20	1.87	30	[BMIM][PF_6]	10	-	-	-	-	$BN_{0.121}O_{0.095}H_{0.070}$
8	25	1	20	1.87	30	[BMIM][PF_6]	10	-	-	-	-	$BN_{0.217}O_{0.183}H_{0.114}$
9	25	2	20	1.87	30	[BMIM][PF_6]	10	-	-	-	-	$BN_{0.343}O_{0.239}H_{0.183}$

10	25	10	20	1.87	30	[BMIM][PF_6]	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
11	25	5	18	1.87	30	[BMIM][PF_6]	10	0	No products	-	-	-
12	25	5	25	1.87	30	[BMIM][PF_6]	10	100	721	2.2×0.20+5.3×0.80	4.7 (4.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
13	25	5	30	1.87	30	[BMIM][PF_6]	10	100	579	2.2×0.05+5.3×0.95	3.7 [c] (5.2)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
14	25	5	20	1.80	30	[BMIM][PF_6]	10	95	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
15	25	5	20	2.00	30	[BMIM][PF_6]	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
16	25	5	20	2.50	30	[BMIM][PF_6]	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
17	25	5	20	1.87	50	[BMIM][PF_6]	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
18	25	5	20	1.87	100	[BMIM][PF_6]	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
19	25	5	20	1.87	30	[BMIM]Cl	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
20	25	5	20	1.87	30	[BMIM][BF_4]	10	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
21	25	5	20	1.87	30	[BMIM][PF_6]	8	80	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
22	25	5	20	1.87	30	[BMIM][PF_6]	12	100	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$
23	25	5	20	1.87	30	[BMIM][PF_6]	15	95	1023	2.2×0.52+5.3×0.48	3.7 [c] (3.7)[d]	$BN_{0.452}O_{0.308}H_{0.240}$

Note: [a] The mass of CuB_{23} is 50mg;

[b] Pore size distribution obtained from N_2 adsorption/desorption expressed as (Average pore diameter of pore 1 × the ratio of pore 1 + Average

pore diameter of pore 2 × (1- the ratio of pore 1))；

[c] Average pore diameter = Average pore diameter of pore 1 × the ratio of pore 1 + Average pore diameter of pore 2 × (1- the ratio of pore 1);

[d] Pore diameters obtained by STEM averaged from 300 pores.

Table S4 Evaluated model parameters of the adsorption isotherms of B-N-O-H nanofoams over MB at 298 K

Langmuir model	**Freundlich model**
$q_m = 3333\ mgg^{-1}$	$1/n = 0.3995$
$K_L = 0.004478\ (Lmg^{-1})$	$K_F = 1.214\ (mgg^{-1})(Lmg^{-1})^{1/n}$
$R^2 = 0.9978$	$R^2 = 0.9781$

Table S5 Comparison of the adsorption capacity of MB by different adsorbents

Adsorbents	**CDI or not**	**q_m / mgg^{-1}**
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ nanofoams in this work obtained at 298 K	yes	3333
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ nanofoams in this work obtained at 308 K	yes	2994
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ nanofoams in this work obtained at 318 K	yes	2898
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ nanofoams in this work obtained at 328 K	yes	2544
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ nanofoams in this work obtained at 25 W of plasma power	yes	2659
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ nanofoams in this work obtained at 30 W of plasma power	yes	2403
Amorphous $BN_{0.452}O_{0.308}H_{0.240}$ in this work	yes	922
Amorphous $BN_{0.121}O_{0.095}H_{0.070}$ in this work	yes	843
Amorphous $BN_{0.217}O_{0.183}H_{0.114}$ in this work	yes	752
Amorphous $BN_{0.343}O_{0.239}H_{0.183}$ in this work	yes	660
Amorphous BN in this work	yes	520
Commercial BN	yes	130
mesoporous BN fibers	no	631[5a]
Porous BN nanosheets	no	313[5b]
BN nanonet	no	327.8[5 h]
BN nanocarpets	no	272.4[5j]
MOFs	no	952[22a]
ZJU-24	no	902[22b]
BIT-1	no	810[22]c
Amino-MIL-101(Al)	no	762[22d]
MIL-100(Fe)	no	736.2[22e]
POM@MIL-101	no	371[22f]
MOF-235	no	187[22g]
Coconut husk activated carbon	no	434.78[22h]

Table S6 Evaluated model parameters of the adsorption isotherms of B-N-O-H nanofoams over MB at 298 K with different ratios of 2.2 nm pores

Samples	**Pore sizes[a] / nm**	**Langmuir model**			**Freundlich model**		
		q_m / mgg^{-1}	K_L / Lmg^{-1}	R^2	1/n	K_F/(mgg^{-1})(Lmg^{-1})$^{1/n}$	R^2
1	2.2×0.42+5.3×0.58	2994	4.304×10^{-3}	0.9977	0.4118	1.222	0.9700
2	2.2×0.30+5.3×0.70	2898	3.912×10^{-3}	0.9978	0.4197	1.228	0.9701
3	2.2×0.20+5.3×0.80	2659	3.854×10^{-3}	0.9979	0.4272	1.233	0.9701
4	2.2×0.11+5.3×0.89	2544	3.793×10^{-3}	0.9979	0.4336	1.239	0.9769
5	2.2×0.05+5.3×0.95	2403	3.638×10^{-3}	0.9985	0.4407	1.246	0.9769

Note: [a] Pore size distribution obtained from N_2 adsorption/desorption expressed as (Average pore diameter of pore 1 × the ratio of pore 1 + Average pore diameter of pore 2 × (1- the ratio of pore 1))

Table S7 MB electrosorption dimensionless quantity (R_L) over B-N-O-H nanofoams at different initial concentrations

Initial concentrations / mgL^{-1}	**R_L**
100	0.69
200	0.52
300	0.43
400	0.36
600	0.27
800	0.22
1000	0.18
1200	0.16
1500	0.13

Table S8 Parameters of pseudo-first-order and pseudo-second-order models for the electro-adsorption of MB onto B-N-O-H nanofoams at 298 K

Pseudo-first-order model	**Pseudo-second-order model**
C_0 = 600 mgL^{-1}	C_0 = 600 mgL^{-1}
$q_{e,\,exp}$ = 1991 mgg^{-1}	$q_{e,\,exp}$ = 1991 mgg^{-1}
$q_{e,cal}$ = 184 mgg^{-1}	$q_{e,cal}$ = 2000 mgg^{-1}
K_1= 0.0574	K_2 = 1.40×10^{-3}
R^2 = 0.7431	R^2 = 0.9999

Table S9 Parameters of pseudo-first-order and pseudo-second-order kinetics in terms of different voltage

Bias potential / V	**Pseudo-first-order**			**Pseudo-second-order**		
	$q_{e,cal}$/ mgg^{-1}	K_1/ min^{-1}	R^2	$q_{e,cal}$ / mgg^{-1}	K_2/ gmg^{-1} min^{-1}	R^2
0	42.89	0.0439	0.8590	312	3.53×10^{-3}	0.9997
0.4	75.02	0.0415	0.8250	833	2.40×10^{-3}	0.9998
0.8	95.91	0.0460	0.8473	1250	2.13×10^{-3}	0.9999

Table S10 Parameters of pseudo-first-order and pseudo-second-order kinetics in terms of different voltage

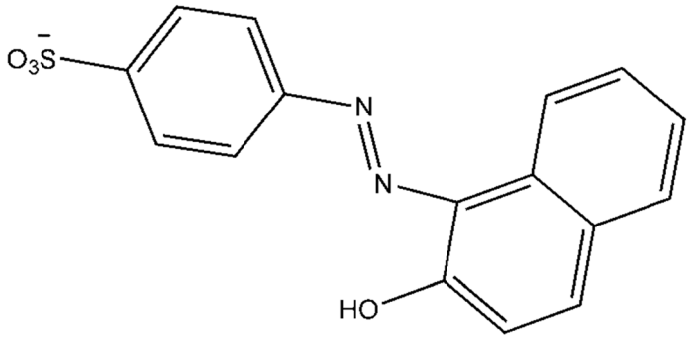
Sample	Pore sizes[a] / nm	Pseudo-first-order			Pseudo-second-order		
		$q_{e,cal}$/ mgg^{-1}	K_1/ min^{-1}	R^2	$q_{e,cal}$ / mgg^{-1}	K_2/ gmg^{-1} min^{-1}	R^2
1	2.2×0.42+5.3×0.58	110.1	0.0452	0.8551	1848	1.36×10^{-3}	0.9999
2	2.2×0.30+5.3×0.70	105.0	0.0438	0.8250	1752	1.29×10^{-3}	0.9998
3	2.2×0.20+5.3×0.80	98.9	0.0424	0.8451	1653	1.23×10^{-3}	0.9999
4	2.2×0.11+5.3×0.89	93.7	0.0412	0.8451	1567	1.17×10^{-3}	0.9998
5	2.2×0.05+5.3×0.95	87.9	0.0400	0.8450	1470	1.12×10^{-3}	0.9999

Note: [a] Pore size distribution obtained from N_2 adsorption/desorption expressed as (Average pore diameter of pore 1 × the ratio of pore 1 + Average pore diameter of pore 2 × (1- the ratio of pore 1))

Table S11 Thermodynamic parameters for the adsorption of MB onto B-N-O-H nanofoams

Temperature / K	ΔG/(kJ mol^{-1})	ΔH/(kJ mol^{-1})	ΔS/(J mol^{-1})
298 K	-3.971	-13.271	-31.4
308 K	-3.438		
318 K	-3.070		
328 K	-2.748		

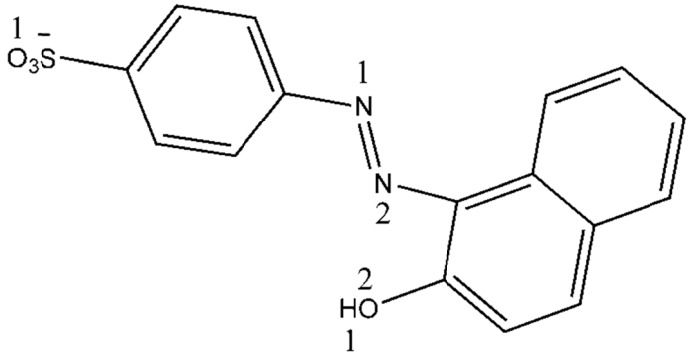
Table S12 Comparison of Solid state ^{33}S NMR shifts for B-N-O-H nanofoams, AO7, B-N-O-H nanofoams after being charged in 600mgL^{-1} AO7 at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of S atoms / ppm**
	S*
B-N-O-H nanofoams	-
AO7	-7.9
0V**	-9.5
1.2V**	-10.4
Δδ (0 V- B-N-O-H nanofoams)	-
Δδ (0 V- AO7)	-1.6
Δδ (1.2V- 0 V)	-0.9

Note: * indicates the atom from the dye ions; ** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes

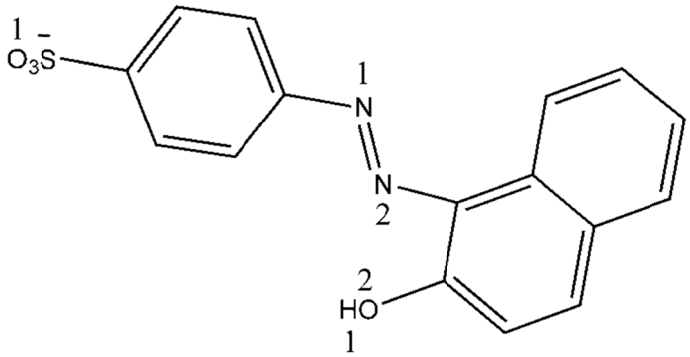
Table S13 Comparison of Solid state ^{17}O NMR shifts for B-N-O-H nanofoams, AO7, B-N-O-H nanofoams after being charged in 600mgL^{-1} AO7 at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of O atoms / ppm								
	$OB_{1/3}$	**$OB_{1/4}$**	**O*-1**	**ON_2**	**ON*-1**	**ON*-2**	**O*-2**	**OH*-1**	**OH**
B-N-O-H nanofoams	145.0	123.0	-	112.0	-	-	-	-	50.0
AO7	-	-	132.1		-	-	69.8	-	-
0V**	143.8	121.8	130.8	110.8	83.3	75.8	68.3	65.6	48.8
1.2V**	143	120.8	129.7	109.8	82.1	74.5	67.3	64.7	47.9
Δδ (0 V- B-N-O-H nanofoams)	-1.2	-1.2	-	-1.2	-	-	-	-	-1.2
Δδ (0 V- AO7)	-	-	-1.3	-	-	-	-1.5	-	-
Δδ (1.2V- 0 V)	-0.8	-1.0	-0.9	-1.0	-0.8	-1.4	-1.0	-0.9	-0.9

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

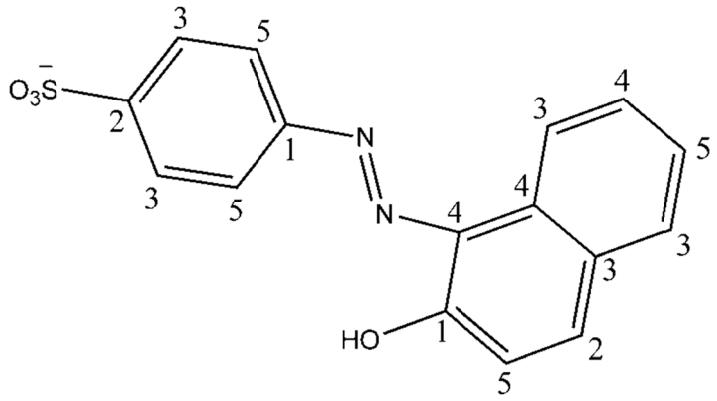
Table S14 Comparison of Solid state ^{15}N NMR shifts for B-N-O-H nanofoams, AO7, B-N-O-H nanofoams after being charged in 600mgL^{-1} AO7 at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of N atoms / ppm								
	$NB_{1/3}$	**$NB_{1/4}$**	**NO_2**	**NH_2**	**NH*-1**	**NO*-1**	**NO*-2**	**N*-1**	**N*-2**
B-N-O-H nanofoams	133.0	92.0	56.0	-30.0	-	-	-	-	-
AO7		-	-	-	-	-	-	-227.0	-229.0
0V**	131.5	90.5	54.5	-31.5	-28.9	13.0	2.5	-217.0	-239.0
1.2V**	130.6	89.6	53.7	-32.5	-27.9	11.8	1.1	-221.0	-245.0
Δδ (0 V- B-N-O-H nanofoams)	-1.5	-1.5	-1.5	-1.5	-	-	-	-	-
Δδ (0 V- AO7)	-	-	-	-		-	-	-10.0	-10.0
Δδ (1.2V- 0 V)	-0.9	-0.9	-0.8	-1.0	-1.0	-1.2	-1.4	-6.0	-6.0

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

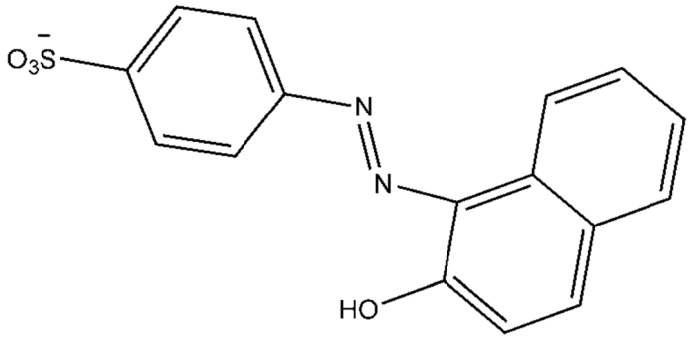
Table S15 Comparison of Solid state ^{13}C NMR shifts for B-N-O-H nanofoams, AO7, B-N-O-H nanofoams after being charged in 600mgL^{-1} AO7 at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of C atoms / ppm				
	C*-1	C*-2	C*-3	C*-4	C*-5
B-N-O-H nanofoams	-	-	-	-	-
AO7	157.2	146.5	128.7	126.5	123.5
0V**	156.2	145.6	127.8	125.5	122.5
1.2V**	155.4	145.0	127.2	124.8	121.9
Δδ (0 V- B-N-O-H nanofoams)	-	-	-	-	-
Δδ (0 V- AO7)	-1.0	-0.9	-0.9	-1.0	-1.0
Δδ (1.2V- 0 V)	-0.6	-0.6	-0.6	-0.7	-0.6

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

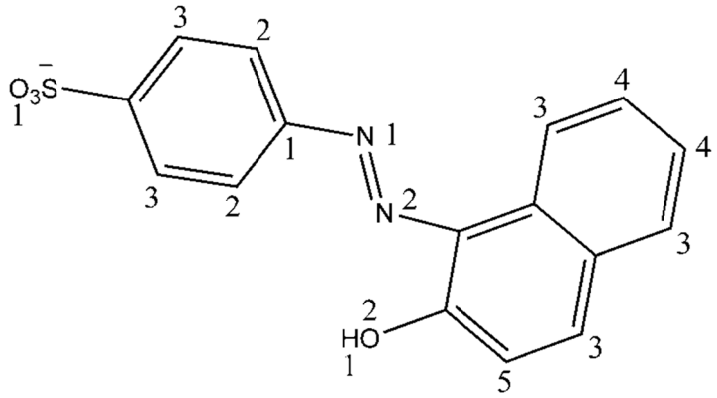
Table S16 Comparison of Solid state ^{11}B NMR shifts for B-N-O-H nanofoams, AO7, B-N-O-H nanofoams after being charged in 600mgL^{-1} AO7 at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of B atoms / ppm**						
	BN_3	**BN_3**	**BO_3**	**BO_3**	**BO_4**	**BN_4**	**BH_2**
B-N-O-H nanofoams	19.2	16.0	15.7	12.5	6.0	1.7	-4.0
AO7	-	-	-	-	-	-	-
0V**	18.7	15.5	15.2	12.0	5.5	1.2	-4.5
1.2V**	18.4	15.1	14.8	11.5	5.1	0.7	-4.9
Δδ (0 V- B-N-O-H nanofoams)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Δδ (0 V- AO7)	-	-	-	-	-	-	-
Δδ (1.2V- 0 V)	-0.3	-0.4	-0.4	-0.5	-0.4	-0.5	-0.4

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

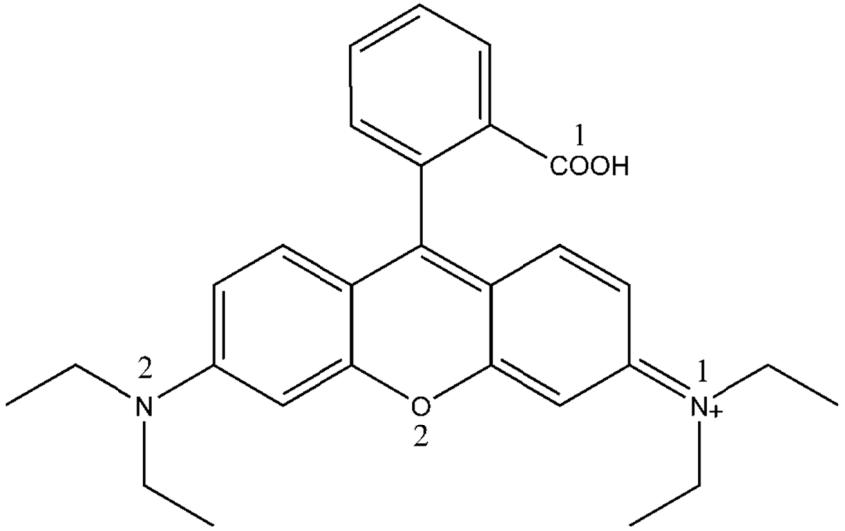
Table S17 Comparison of Solid state ^{1}H NMR shifts for B-N-O-H nanofoams, AO7, B-N-O-H nanofoams after being charged in 600mgL^{-1} AO7 at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of H atoms / ppm**											
	HO	**$HN_{1/2}$**	**HN*-1**	**HN*-2**	**$HB_{1/2}$**	**H*-1**	**H*-2**	**H*-3**	**H*-4**	**H*-5**	**HO*-1**	**HO*-2**
B-N-O-H nanofoams	15.69	15.42	-	-	15.00	-	-	-	-	-	-	-
AO7	-	-	-	-	-	5.27	8.41	7.95	7.35	7.00	-	-
0V**	15.63	15.37	15.23	15.19	14.93	5.20	8.34	7.88	7.27	6.92	6.14	3.58
1.2V**	15.59	15.32	15.19	15.14	14.89	5.14	8.29	7.84	7.21	6.87	6.08	3.51
Δδ (0 V- B-N-O-H nanofoams)	-0.06	-0.05	-	-	-0.07	-	-	-	-	-	-	-
Δδ (0 V- AO7)	-	-	-	-	-	-0.07	-0.07	-0.07	-0.08	-0.08		
Δδ (1.2V- 0 V)	-0.04	-0.05	-0.04	-0.05	-0.04	-0.06	-0.05	-0.04	-0.06	-0.05	-0.06	-0.07

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

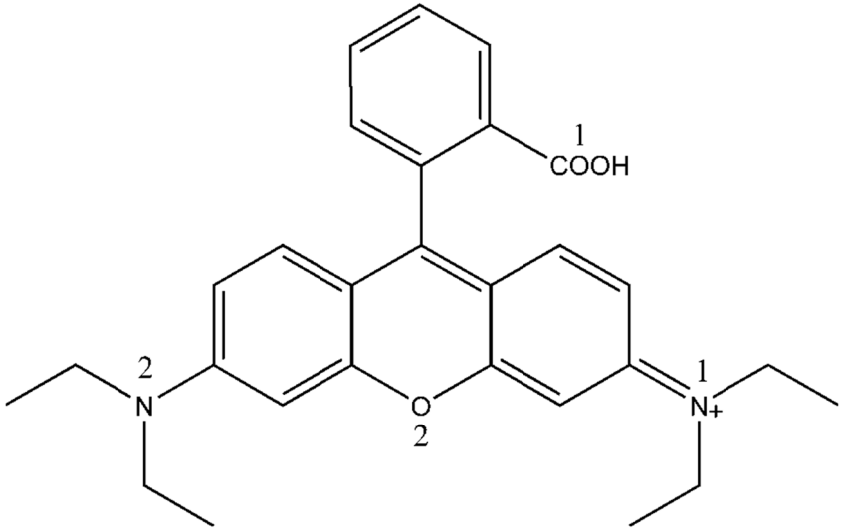
Table S18 Comparison of Solid state ^{17}O NMR shifts for B-N-O-H nanofoams, RhB, B-N-O-H nanofoams after being charged in 600mgL^{-1} RhB at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of O atoms / ppm							
	$OB_{1/3}$	**$OB_{1/4}$**	**O*-1**	**ON_2**	**ON*-1**	**ON*-2**	**OH**	**O*-2**
B-N-O-H nanofoams	145.0	123.0	-	112.0	-	-	50.0	-
RhB	-	-	293.2	-	-	-	-	12.1
0V**	143.5	121.5	291.0	110.5	81.0	75.0	48.5	10.0
1.2V**	140.0	118.1	287.0	107.2	76.1	71.0	45.1	5.2
Δδ (0 V- B-N-O-H nanofoams)	-1.5	-1.5	-2.2	-1.5	-	-	-1.5	-
Δδ (0 V- RhB)								
Δδ (1.2V- 0 V)	-3.5	-3.4	-4.0	-3.3	-3.9	-4.0	-3.4	-4.8

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

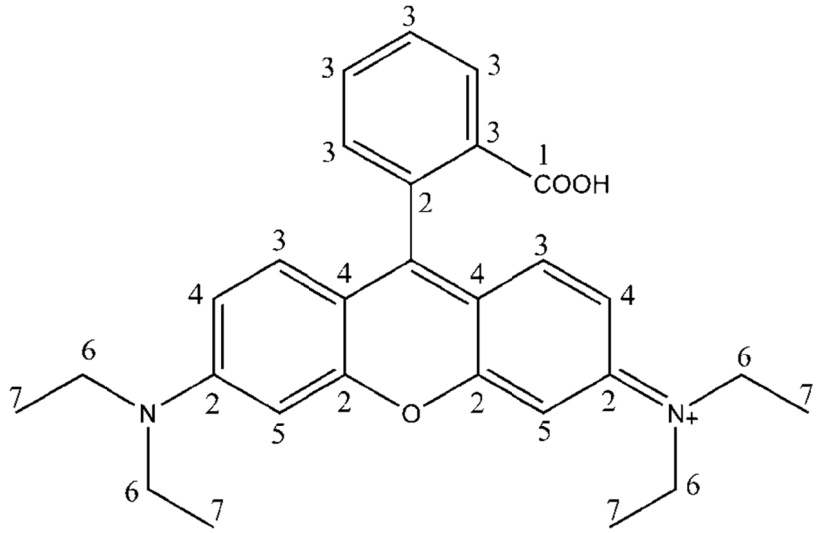
Table S19 Comparison of Solid state ^{15}N NMR shifts for B-N-O-H nanofoams, RhB, B-N-O-H nanofoams after being charged in 600mgL^{-1} RhB at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of N atoms / ppm							
	$NB_{1/3}$	**$NB_{1/4}$**	**NO_2**	**NH_2**	**NO*-1**	**NO*-2**	**N*-1**	**N*-2**
B-N-O-H nanofoams	133	92	56	-30	-	-	-	-
RhB	-	-	-	-	-	-	-302	-305
0V**	131	90	54	-32	17	5	-310	-316
1.2V**	126	86	50	-28	11	-1	-326	-336
Δδ (0 V- B-N-O-H nanofoams)	-2	-2	-2	-2	-	-	-	-
Δδ (0 V- RhB)	-	-	-	-	-	-	-8	-11
Δδ (1.2V- 0 V)	-5	-4	-4	-4	-6	-6	-16	-20

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

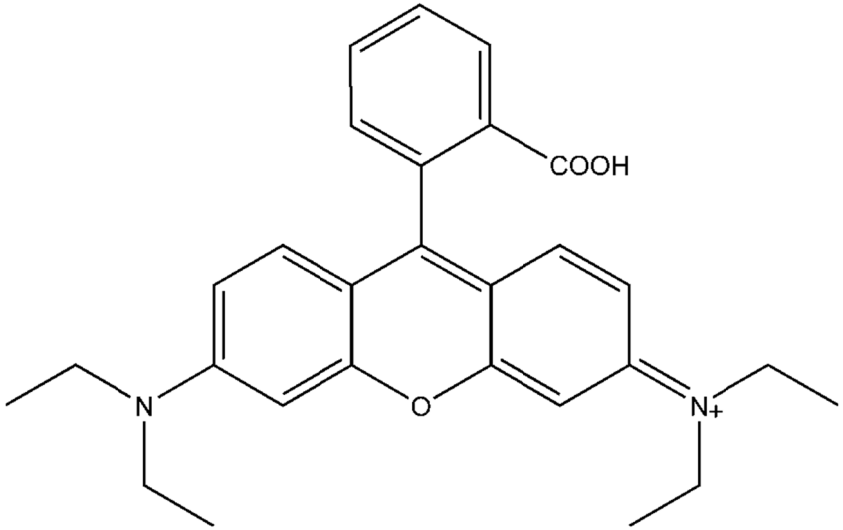
Table S20 Comparison of Solid state ^{13}C NMR shifts for B-N-O-H nanofoams, RhB, B-N-O-H nanofoams after being charged in 600mgL^{-1} RhB at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of C atoms / ppm						
	C*-1	C*-2	C*-3	C*-4	C*-5	C*-6	C*-7
B-N-O-H nanofoams	-	-	-	-	-	-	-
RhB	166.0	155.1	129.2	110.1	93.0	44.1	10.2
0V**	165.0	153.9	127.8	108.1	91.9	42.8	9.1
1.2V**	161.9	151.1	124.6	105.6	88.9	40.0	6.7
Δδ (0 V- B-N-O-H nanofoams)	-	-	-	-	-	-	-
Δδ (0 V- RhB)	-1.0	-1.2	-1.4	-2.0	-1.1	-1.3	-1.1
Δδ (1.2V- 0 V)	-3.1	-2.8	-3.2	-2.5	-3.0	-2.8	-2.3

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

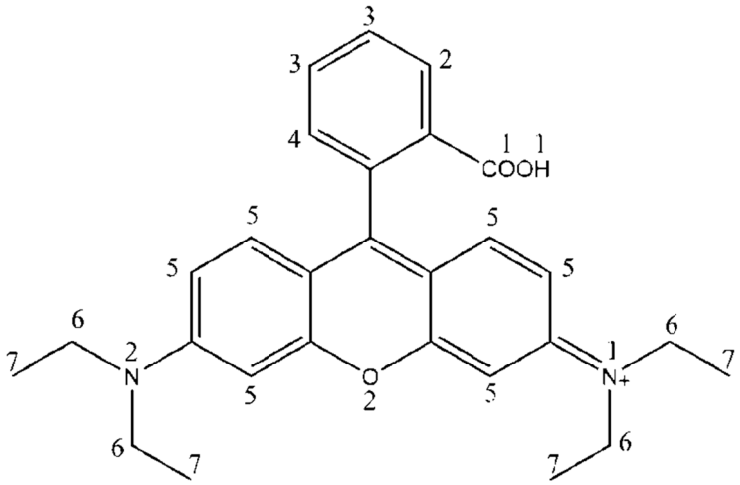
Table S21 Comparison of Solid state ^{11}B NMR shifts for B-N-O-H nanofoams, RhB, B-N-O-H nanofoams after being charged in 600mgL^{-1} RhB at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of B atoms / ppm						
	BN_3	BN_3	BO_3	BO_3	BO_4	BN_4	BH_2
B-N-O-H nanofoams	19.2	16.0	15.7	12.5	6.0	1.7	-4.0
RhB	-	-	-	-	-	-	-
0V**	18.6	15.4	15.1	11.9	5.4	1.1	-4.6
1.2V**	16.5	13.4	13.0	9.9	3.2	-0.8	-6.6
Δδ (0 V- B-N-O-H nanofoams)	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Δδ (0 V- RhB)	-	-	-	-	-	-	-
Δδ (1.2V- 0 V)	-2.1	-2.0	-2.1	-2.0	-2.2	-1.9	-2.0

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

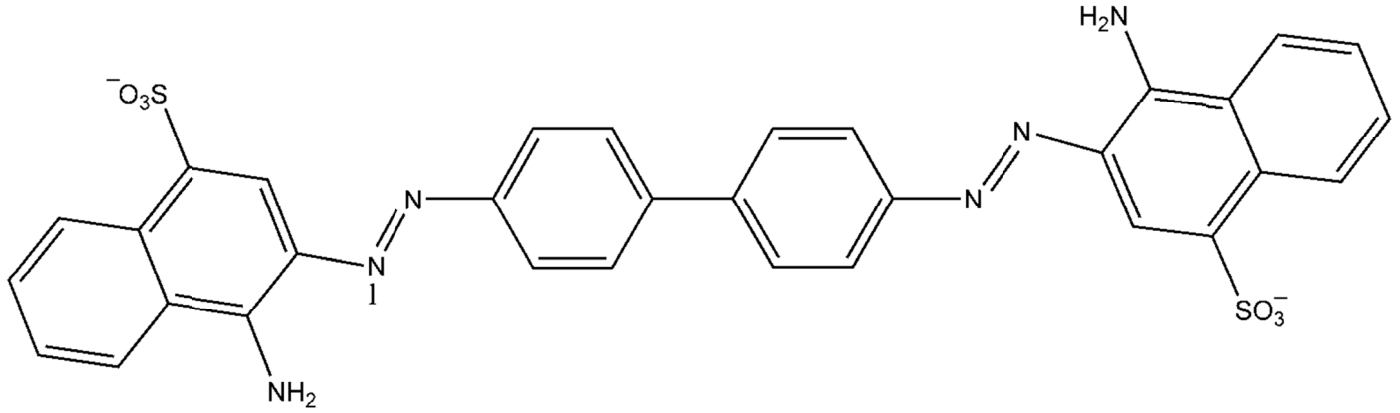
Table S22 Comparison of Solid state ^{1}H NMR shifts for B-N-O-H nanofoams, RhB, B-N-O-H nanofoams after being charged in 600mgL^{-1} RhB at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of H atoms / ppm													
	HO	**$HN_{1/2}$**	**HN*-1**	**HN*-2**	**$HB_{1/2}$**	**HO*-1**	**HO*-2**	**H*-1**	**H*-2**	**H*-3**	**H*-4**	**H*-5**	**H*-6**	**H*-7**
B-N-O-H nanofoams	15.69	15.42	-	-	15.00	-	-	-	-	-	-	-	-	-
RhB	-	-	-	-	-	-	-	10.93	8.11	7.80	7.30	6.80	3.50	1.20
0V**	15.60	15.33	15.15	15.09	14.10	10.02	9.91	10.88	8.07	7.75	7.27	6.76	3.45	1.16
1.2V**	15.34	15.06	14.90	14.83	13.85	9.69	9.59	10.72	7.93	7.63	7.14	6.63	3.3	1.02
Δδ (0 V- B-N-O-H nanofoams)	-0.09	-0.09	-	-	-0.09	-	-	-	-	-	-	-	-	-
Δδ (0 V- RhB)	-	-	-	-	-	-	-	-0.05	-0.04	-0.05	-0.03	-0.04	-0.05	-0.04
Δδ (1.2V- 0 V)	-0.26	-0.27	-0.25	-0.26	-0.25	-0.33	-0.32	-0.16	-0.14	-0.12	-0.13	-0.13	-0.15	-0.14

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

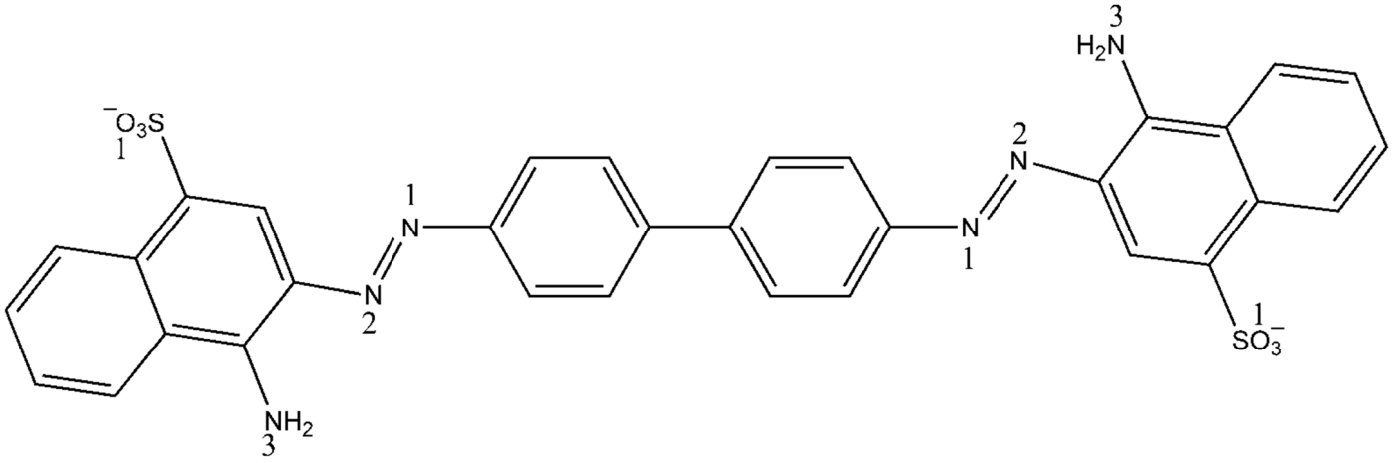
Table S23 Comparison of Solid state ^{33}S NMR shifts for B-N-O-H nanofoams, Congo red, B-N-O-H nanofoams after being charged in 600mgL^{-1} Congo red at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of S atoms / ppm**
	S*
B-N-O-H nanofoams	-
Congo red	-10.0
0V**	-11.0
1.2V**	-11.6
Δδ (0 V- B-N-O-H nanofoams)	-
Δδ (0 V- Congo red)	-1.0
Δδ (1.2V- 0 V)	-0.6

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

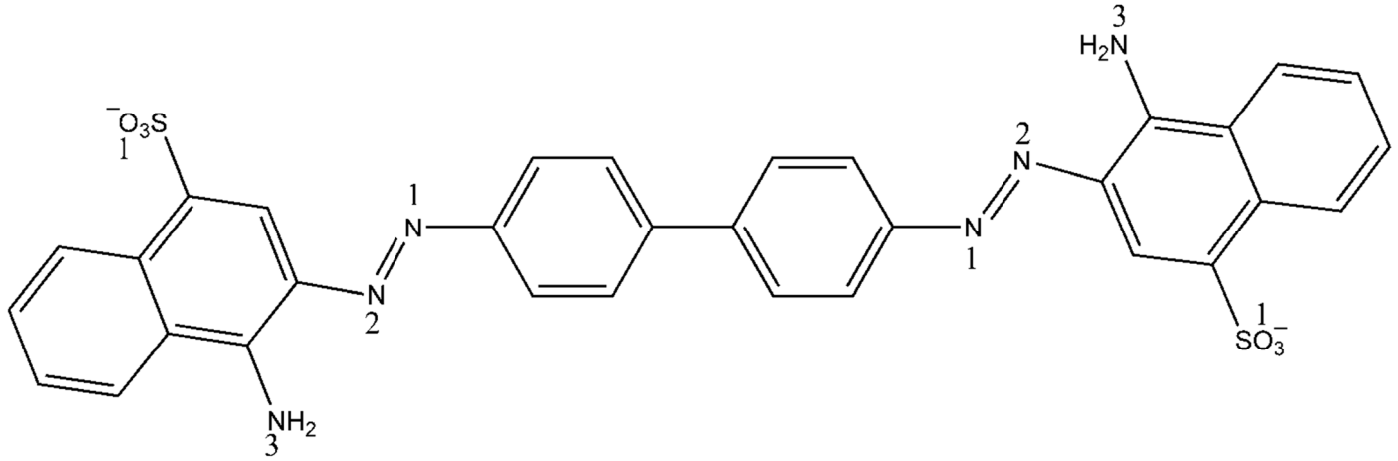
Table S24 Comparison of Solid state ^{17}O NMR shifts for B-N-O-H nanofoams, Congo red, B-N-O-H nanofoams after being charged in 600mgL^{-1} Congo red at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of O atoms / ppm								
	$OB_{1/3}$	**$OB_{1/4}$**	**O***	**ON_2**	**ON*-1**	**ON*-2**	**ON*-3**	**OH*-1**	**OH**
B-N-O-H nanofoams	145.0	123.0	-	112.0	-	-	-	-	50.0
Congo red	-	-	133.0	-				-	
0V**	144.0	122.0	135.1	111.0	90.1	87.0	63.2	55.0	49.0
1.2V**	143.5	121.3	134.1	110.4	89.2	86.1	62.3	54.2	48.4
Δδ (0 V- B-N-O-H nanofoams)	-1.0	-1.0	-	-1.0	-	-	-	-	-1.0
Δδ (0 V- Congo red)	-	-	-1.9	-	-	-	-	-	-
Δδ (1.2V- 0 V)	-0.5	-0.7	-1.0	-0.6	-0.9	-0.9	-0.9	-0.8	-0.6

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

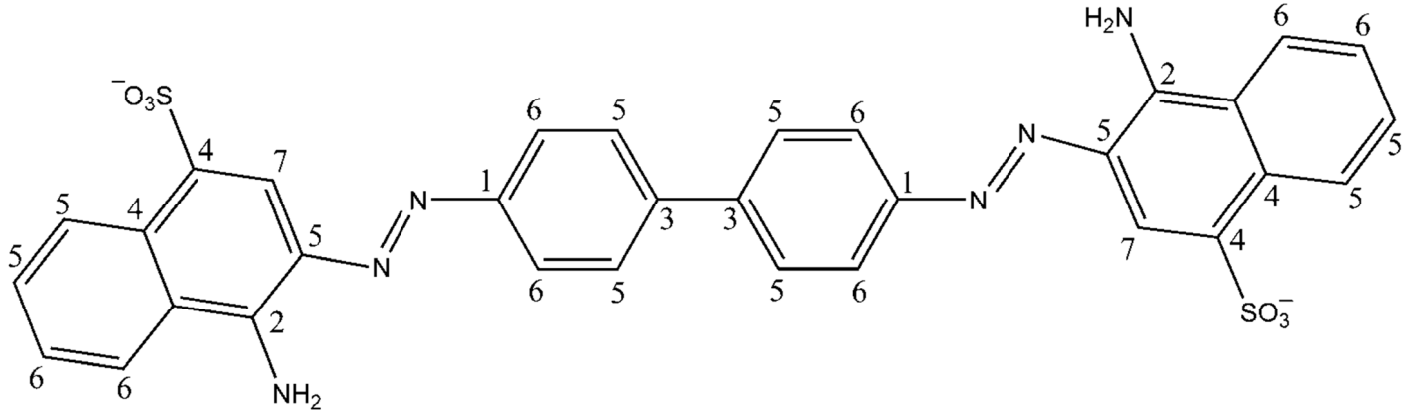
Table S25 Comparison of Solid state ^{15}N NMR shifts for B-N-O-H nanofoams, Congo red, B-N-O-H nanofoams after being charged in 600mgL^{-1} Congo red at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of N atoms / ppm								
	$NB_{1/3}$	**$NB_{1/4}$**	**NO_2**	**NH_2**	**NO*-1**	**NH***	**N*-1**	**N*-2**	**N*-3**
B-N-O-H nanofoams	133	92.0	56.0	-30.0	-	-	-	-	-
Congo red	-	-	-	-	-	-	-10.6	-203.7	-217.5
0V**	132.1	91.0	55.2	-31.0	3.5	-10.1	-15.1	-207.5	-222.4
1.2V**	131.5	90.4	54.5	-31.4	2.5	-9.1	-18.0	-211.1	-226.0
Δδ (0 V- B-N-O-H nanofoams)	-0.9	-1.0	-0.8	-1.0	-	-	-	-	-
Δδ (0 V- Congo red)	-	-	-	-	-	-	-4.5	-4.8	-4.9
Δδ (1.2V- 0 V)	-0.6	-0.6	-0.7	-0.6	-1.0	-1.0	-2.9	-3.6	-3.6

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

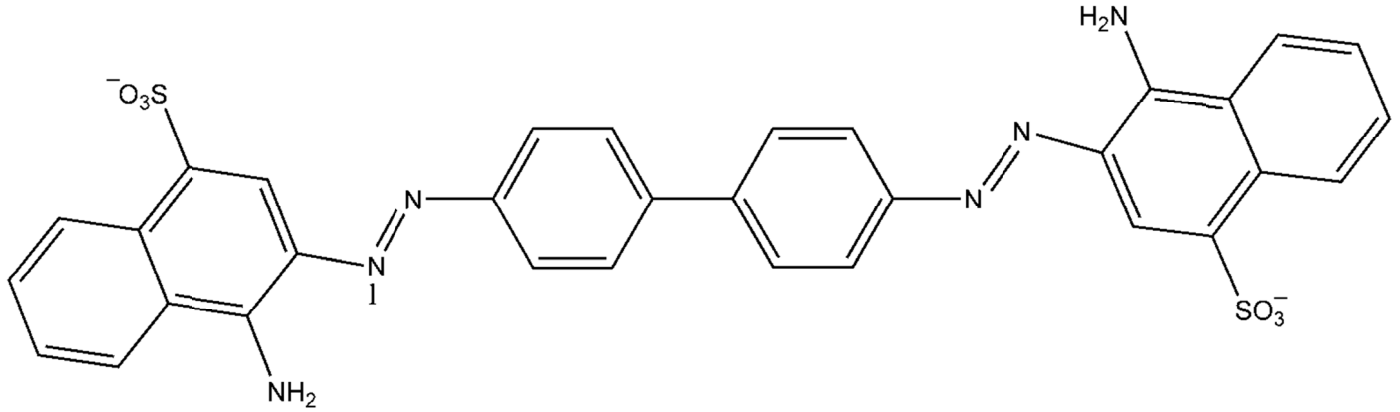
Table S26 Comparison of Solid state ^{13}C NMR shifts for B-N-O-H nanofoams, Congo red, B-N-O-H nanofoams after being charged in 600mgL^{-1} Congo red at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of C atoms / ppm**						
	C*-1	**C*-2**	**C*-3**	**C*-4**	**C*-5**	**C*-6**	**C*-7**
B-N-O-H nanofoams	-	-	-	-	-	-	-
Congo red	151.0	145.3	138.8	132.2	128.0	123.8	116.0
0V**	150.4	144.8	138.3	131.4	127.5	123.2	115.3
1.2V**	150.0	144.3	137.7	130.8	127.0	122.7	114.9
Δδ (0 V- B-N-O-H nanofoams)	-	-	-	-	-	-	-
Δδ (0 V- Congo red)	-0.6	-0.5	-0.5	-0.8	-0.5	-0.4	-0.7
Δδ (1.2V- 0 V)	-0.4	-0.5	-0.6	-0.4	-0.5	-0.5	-0.4

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

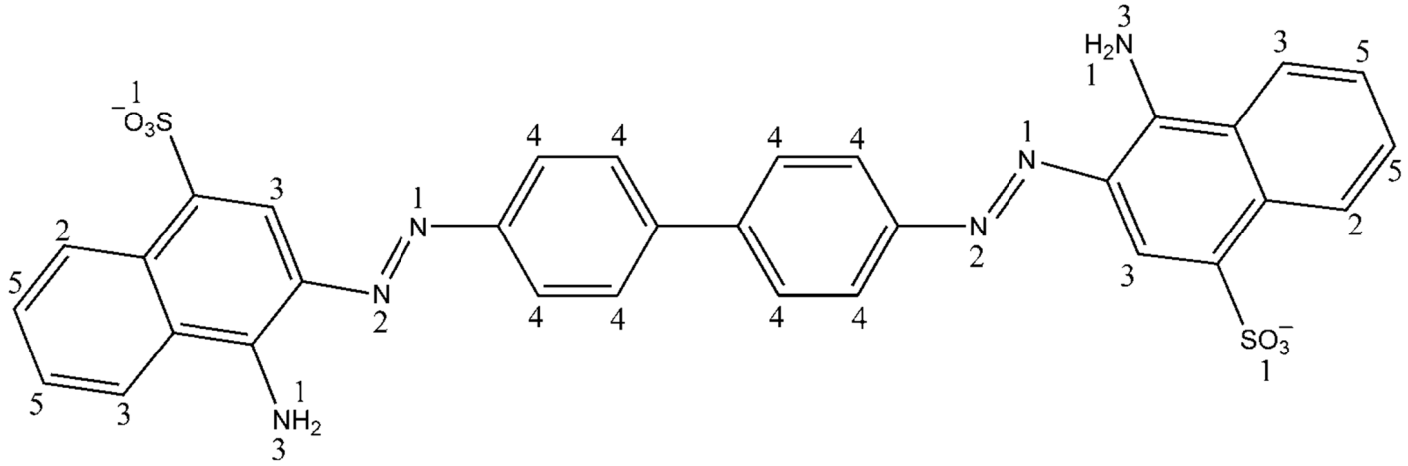
Table S27 Comparison of Solid state ^{11}B NMR shifts for B-N-O-H nanofoams, Congo red, B-N-O-H nanofoams after being charged in 600mgL^{-1} Congo red at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of B atoms / ppm						
	BN_3	**BN_3**	**BO_3**	**BO_3**	**BO_4**	**BN_4**	**BH_2**
B-N-O-H nanofoams	19.2	16.0	15.7	12.5	6.0	1.7	-4.0
Congo red	-	-	-	-		-	-
0V**	18.8	15.6	15.3	12.1	5.6	1.3	-4.4
1.2V**	18.6	15.4	15.1	11.9	5.4	1.1	-4.6
Δδ (0 V- B-N-O-H nanofoams)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Δδ (0 V- Congo red)	-	-	-	-		-	-
Δδ (1.2V- 0 V)	-0.2	-0.3	-0.2	-0.2	-0.3	-0.3	-0.2

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

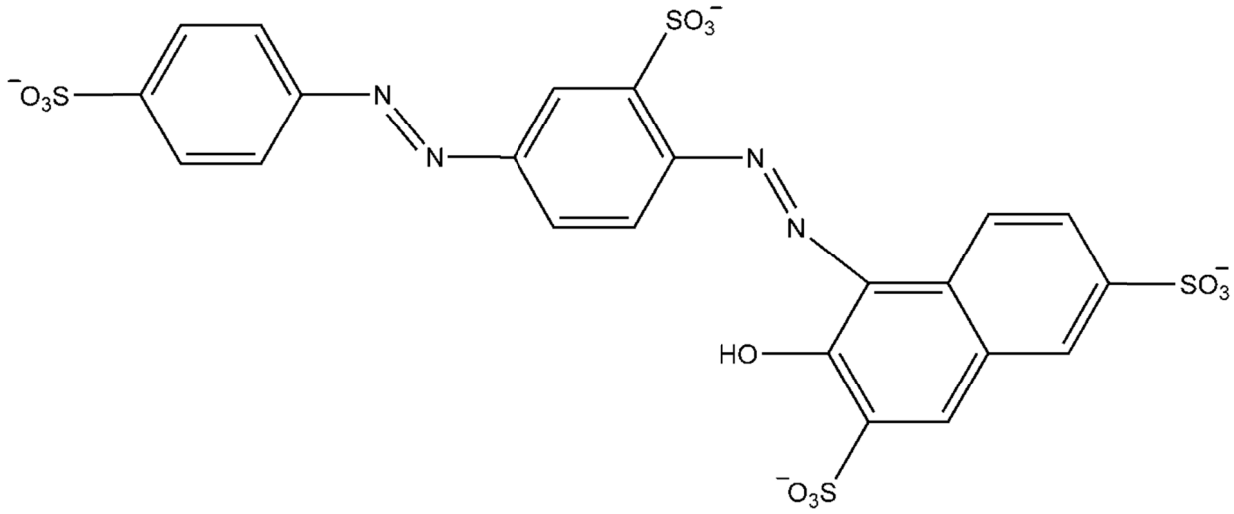
Table S28 Comparison of Solid state ^{1}H NMR shifts for B-N-O-H nanofoams, Congo red, B-N-O-H nanofoams after being charged in 600mgL^{-1} Congo red at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of H atoms / ppm											
	HO	$HN_{1/2}$	HN*-1	HN*-2	HN*-3	$HB_{1/2}$	H*-1	H*-2	H*-3	H*-4	H*-5	HO*-1
B-N-O-H nanofoams	15.69	15.42	-	-	-	15.00	-	-	-	-	-	-
Congo red	-	-	-	-	-	-	6.10	8.67	8.20	7.88	7.42	-
0V**	15.65	15.38	15.18	15.10	5.80	14.96	6.00	8.63	8.16	7.84	7.38	3.60
1.2V**	15.62	15.34	15.15	15.07	5.77	14.93	5.95	8.56	8.12	7.80	7.35	3.57
Δδ (0 V- B-N-O-H nanofoams)	-0.04	-0.04	-	-	-	-0.04	-	-	-	-	-	-
Δδ (0 V- Congo red)	-	-	-	-	-	-	-0.10	-0.04	-0.04	-0.04	-0.04	-
Δδ (1.2V- 0 V)	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

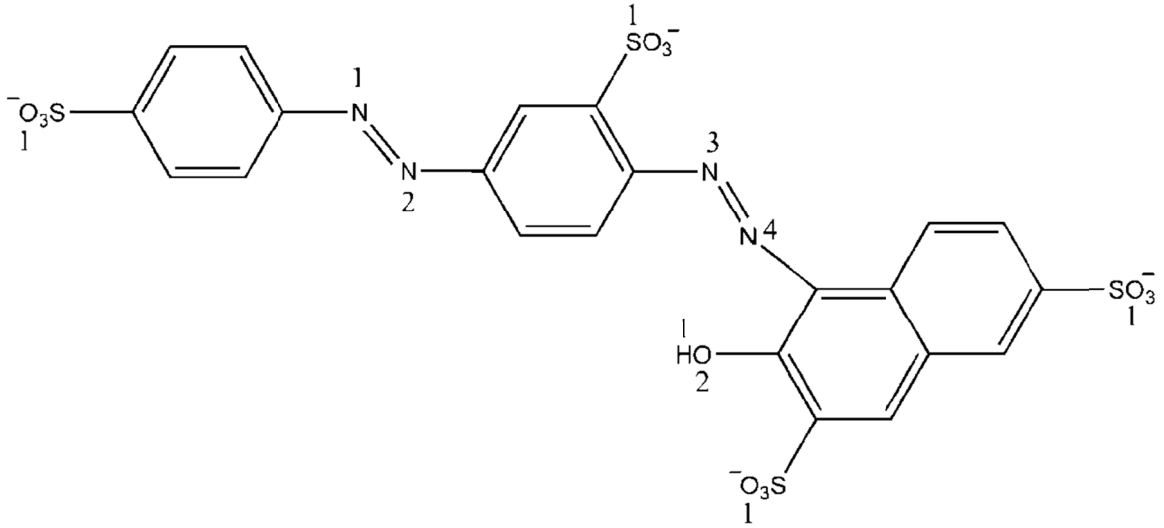
Table S29 Comparison of Solid state ^{33}S NMR shifts for B-N-O-H nanofoams, Ponceau s, B-N-O-H nanofoams after being charged in 600mgL^{-1} Ponceau s at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of S atoms / ppm			
	S*-1	**S*-2**	**S*-3**	**S*-4**
B-N-O-H nanofoams	-	-	-	-
Ponceau s	-7.0	-9.9	-12.9	-15.5
0V**	-7.8	-10.9	-13.7	-16.5
1.2V**	-8.2	-11.4	-14.1	-17.0
Δδ (0 V- B-N-O-H nanofoams)				
Δδ (0 V- Ponceau s)	-0.8	-1.0	-0.8	-1.0
Δδ (1.2V- 0 V)	-0.4	-0.5	-0.4	-0.5

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

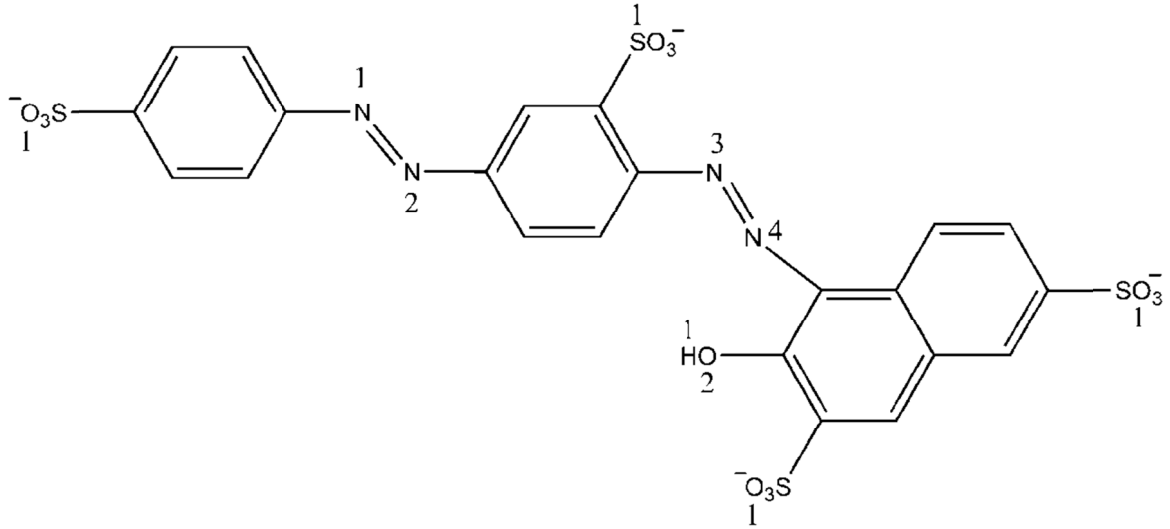
Table S30 Comparison of Solid state ^{17}O NMR shifts for B-N-O-H nanofoams, Ponceau s, B-N-O-H nanofoams after being charged in 600mgL^{-1} Ponceau s at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of O atoms / ppm										
	$OB_{1/3}$	**$OB_{1/4}$**	**O*-1**	**ON_2**	**ON*-1**	**ON*-2**	**ON*-3**	**ON*-4**	**OH**	**OH*-1**	**O*-2**
B-N-O-H nanofoams	145.0	123.0	-	112.0	-	-	-	-	50.0	-	-
Ponceau s	-	-	138.2	-	-	-	-	-	-	-	13.4
0V**	144.2	122.2	137.0	111.2	78.0	74.0	72.0	69.0	49.2	50.2	12.0
1.2V**	143.8	121.7	136.4	110.8	77.3	73.5	71.4	68.5	48.8	49.8	11.3
Δδ (0 V- B-N-O-H nanofoams)	-0.8	-0.8	-	-0.8	-	-	-	-	-0.8	-	-
Δδ (0 V- Ponceau s)	-	-	-1.2	-	-	-	-	-	-	-	-1.4
Δδ (1.2V- 0 V)	-0.4	-0.5	-0.6	-0.4	-0.7	-0.5	-0.6	-0.5	-0.4	-0.4	-0.7

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

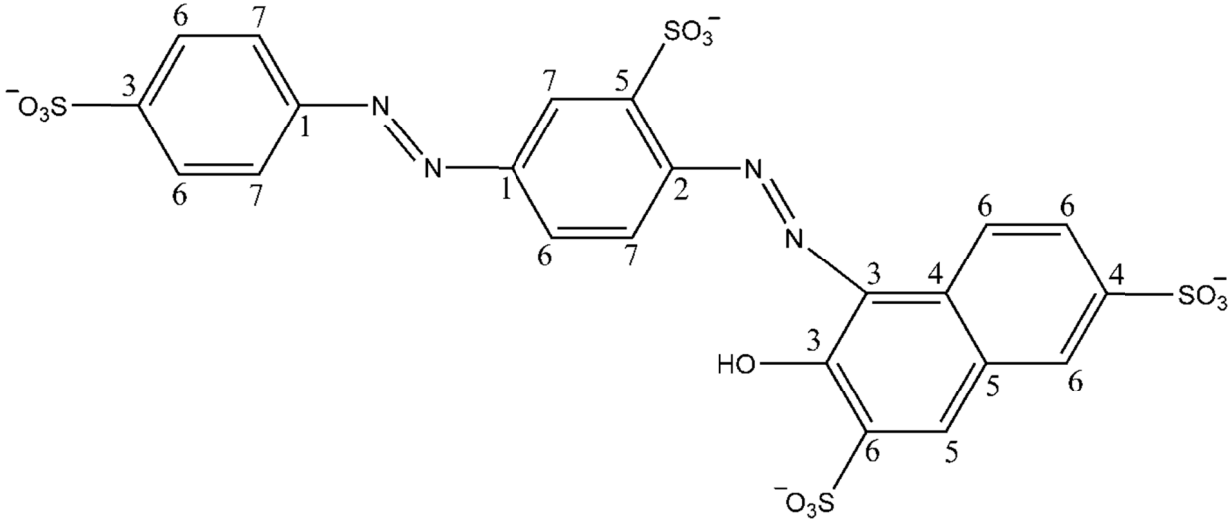
Table S31 Comparison of Solid state ^{15}N NMR shifts for B-N-O-H nanofoams, Ponceau s, B-N-O-H nanofoams after being charged in 600mgL^{-1} Ponceau s at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of N atoms / ppm										
	$NB_{1/3}$	$NB_{1/4}$	NO_2	NH_2	NO*-1	NO*-2	NH*	N*-1	N*-2	N*-3	N*-4
B-N-O-H nanofoams	133.0	92.0	56.0	-30.0	-	-	-	-	-	-	-
Ponceau s	-	-	-	-	-	-	-	-239.0	-229.0	-227.0	-252.0
0V**	132.2	91.2	55.2	-30.8	4.3	1.0	-14.0	-245.0	-233.0	-235.0	-258.0
1.2V**	131.8	90.8	54.9	-31.2	3.6	0.3	-14.6	-248.0	-235.0	-238.0	-261.0
Δδ (0 V- B-N-O-H nanofoams)	-0.8	-0.8	-0.8	-0.8	-	-	-	-	-	-	-
Δδ (0 V- Ponceau s)	-	-	-	-	-	-	-	-6.0	-4.0	-8.0	-6.0
Δδ (1.2V- 0 V)	-0.4	-0.4	-0.3	-0.4	-0.7	-0.7	-0.6	-3.0	-2.0	-3.0	-3.0

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

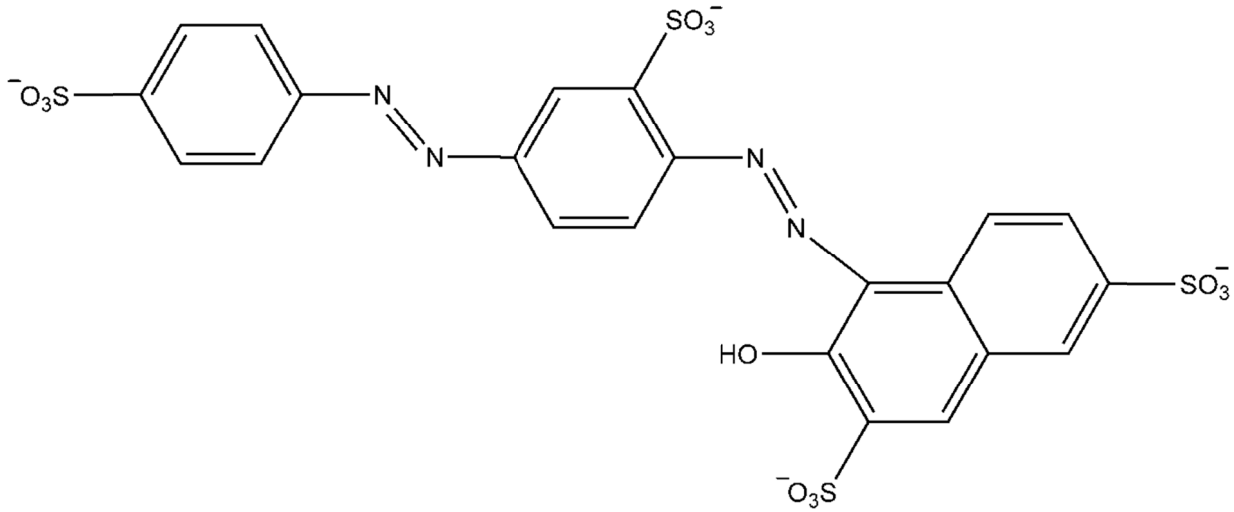
Table S32 Comparison of Solid state ^{13}C NMR shifts for B-N-O-H nanofoams, Ponceau s, B-N-O-H nanofoams after being charged in 600mgL^{-1} Ponceau s at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of C atoms / ppm						
	C*-1	**C*-2**	**C*-3**	**C*-4**	**C*-5**	**C*-6**	**C*-7**
B-N-O-H nanofoams	-	-	-	-	-	-	-
Ponceau s	152.1	149.0	146.6	139.0	131.1	129.0	125.0
0V**	151.5	148.4	146.0	138.4	130.5	128.4	124.4
1.2V**	151.2	148.0	145.6	138.0	130.2	128.0	124.1
Δδ (0 V- B-N-O-H nanofoams)	-	-	-	-	-	-	-
Δδ (0 V- Ponceau s)	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Δδ (1.2V- 0 V)	-0.3	-0.4	-0.4	-0.4	-0.3	-0.4	-0.3

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

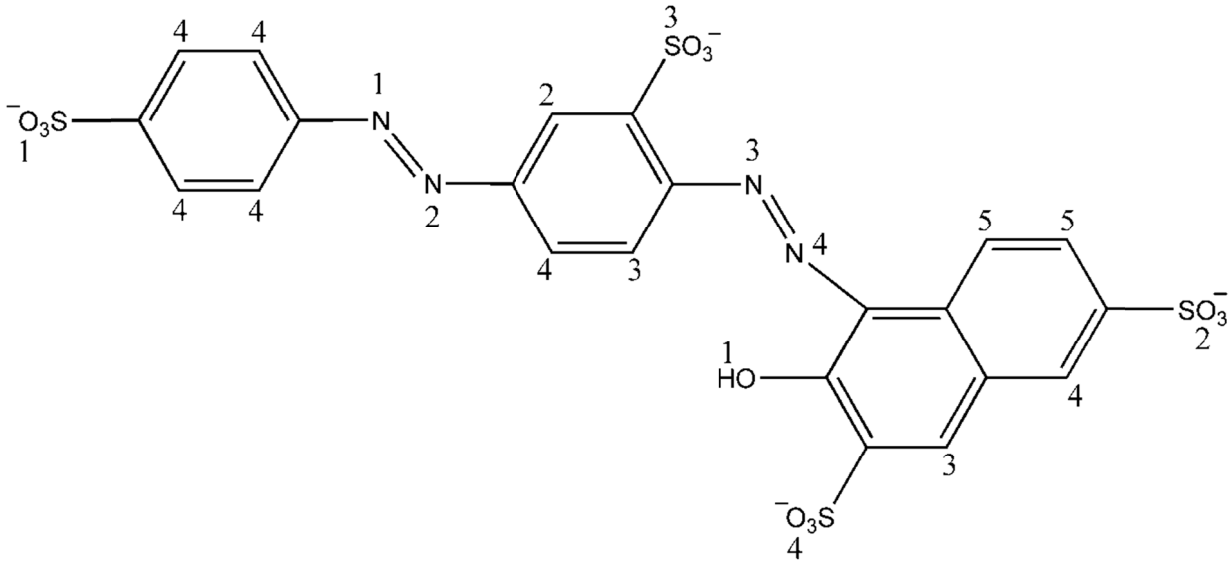
Table S33 Comparison of Solid state ^{11}B NMR shifts for B-N-O-H nanofoams, Ponceau s, B-N-O-H nanofoams after being charged in 600mgL^{-1} Ponceau s at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of B atoms / ppm						
	BN_3	**BN_3**	**BO_3**	**BO_3**	**BO_4**	**BN_4**	**BH_2**
B-N-O-H nanofoams	19.2	16.0	15.7	12.5	6.0	1.7	-4.0
Ponceau s	-	-	-	-		-	-
0V**	18.9	15.7	15.4	12.2	5.7	1.4	-4.3
1.2V**	18.7	15.4	15.1	12.0	5.4	1.2	-4.5
Δδ (0 V- B-N-O-H nanofoams)	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Δδ (0 V- Ponceau s)	-	-	-	-		-	-
Δδ (1.2V- 0 V)	-0.2	-0.3	-0.3	-0.2	-0.3	-0.2	-0.2

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

Table S34 Comparison of Solid state ^{1}H NMR shifts for B-N-O-H nanofoams, Ponceau s, B-N-O-H nanofoams after being charged in 600mgL^{-1} Ponceau s at 0 V and 1.2 V, respectively.

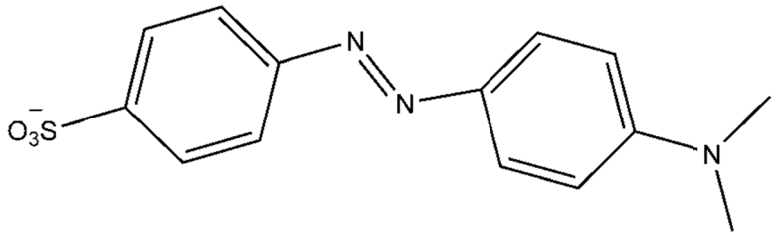


Samples	Chemical shifts of H atoms / ppm															
	HO	**$HN_{1/2}$**	**HN*-1**	**HN*-2**	**HN*-3**	**HN*-4**	**$HB_{1/2}$**	**H*-1**	**H*-2**	**H*-3**	**H*-4**	**H*-5**	**HO*-1**	**HO*-2**	**HO*-3**	**HO*-4**
B-N-O-H nanofoams	15.69	15.42	-	-	-		15.00	-	-	-	-	-	-	-	-	-
Ponceau s	-	-	-	-	-		-	4.45	8.65	8.37	8.18	7.91	-	-	-	-
0V**	15.66	15.39	15.17	15.13	15.08	15.05	14.97	4.35	8.62	8.34	8.15	7.89	3.40	3.35	3.30	3.27
1.2V**	15.6	15.36	15.15	15.11	15.05	15.03	14.9	4.33	8.60	8.31	8.13	7.87	3.37	3.32	3.27	3.24

	4						5									
Δδ (0 V-B-N-O-H nanofoams)	-0.03	-0.03	-	-	-	-	-0.03	-	-	-	-	-	-	-	-	-
Δδ (0 V-Ponceau s)	-	-	-	-	-	-	-	-0.10	-0.03	-0.03	-0.03	-0.02	-	-	-	-
Δδ (1.2V-0 V)	-0.02	-0.03	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

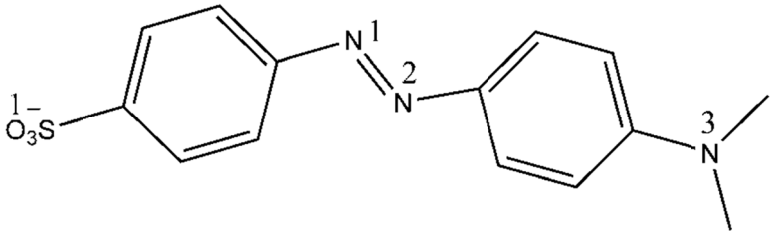
Table S35 Comparison of Solid state ^{33}S NMR shifts for B-N-O-H nanofoams, Methyl orange, B-N-O-H nanofoams after being charged in 600mgL^{-1} Methyl orange at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of S atoms / ppm**
	S*
B-N-O-H nanofoams	-
Methyl orange	-7.2
0V**	-7.7
1.2V**	-8.0
Δδ (0 V- B-N-O-H nanofoams)	-
Δδ (0 V- Methyl orange)	-0.5
Δδ (1.2V- 0 V)	-0.3

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

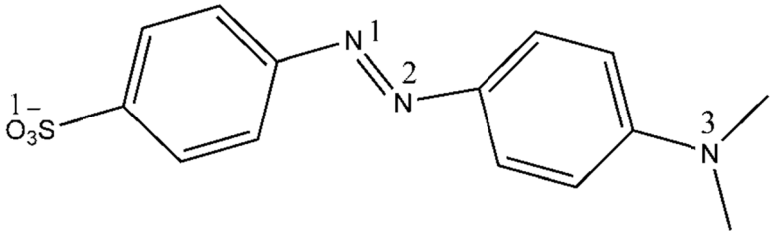
Table S36 Comparison of Solid state ^{17}O NMR shifts for B-N-O-H nanofoams, Methyl orange, B-N-O-H nanofoams after being charged in 600mgL^{-1} Methyl orange at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of O atoms / ppm							
	$OB_{1/3}$	**$OB_{1/4}$**	**O*-1**	**ON_2**	**ON*-1**	**ON*-2**	**ON*-3**	**OH**
B-N-O-H nanofoams	145.0	123.0	-	112.0	-	-	-	50.0
Methyl orange	-	-	134.8	-	-	-	-	-
0V**	144.5	122.5	134.0	111.5	86.2	84.1	80.0	49.5
1.2V**	144.2	122.2	133.5	111.1	85.7	83.6	79.4	49.2
Δδ (0 V- B-N-O-H nanofoams)	-0.5	-0.5	-	-0.5	-	-	-	-0.5
Δδ (0 V- Methyl orange)	-	-	-0.8	-	-	-	-	-
Δδ (1.2V- 0 V)	-0.3	-0.3	-0.5	-0.4	-0.5	-0.5	-0.6	-0.3

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

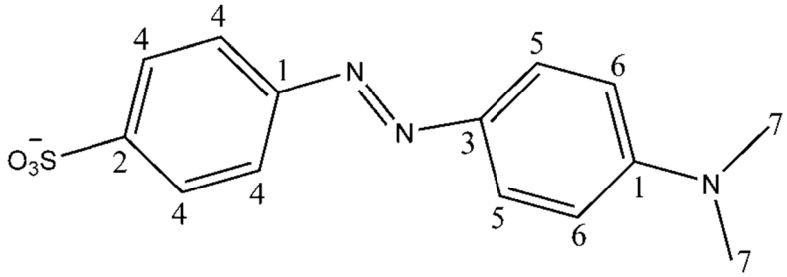
Table S37 Comparison of Solid state ^{15}N NMR shifts for B-N-O-H nanofoams, Methyl orange, B-N-O-H nanofoams after being charged in 600mgL^{-1} Methyl orange at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of N atoms / ppm							
	$NB_{1/3}$	**$NB_{1/4}$**	**NO_2**	**NH_2**	**NO*-1**	**N*-1**	**N*-2**	**N*-3**
B-N-O-H nanofoams	133.0	92.0	56.0	-30.0	-	-	-	-
Methyl orange	-	-	-	-	-	-203.6	-218.0	-242.9
0V**	132.5	91.5	55.5	-30.5	3.3	-207.0	-222.0	-245.0
1.2V**	132.2	91.3	55.2	-30.7	2.8	-209.0	-224.0	-246.0
Δδ (0 V- B-N-O-H nanofoams)	-0.5	-0.5	-0.5	-0.5	-	-	-	-
Δδ (0 V- Methyl orange)	-	-	-	-	-	-3.4	-4.0	-2.1
Δδ (1.2V- 0 V)	-0.3	-0.2	-0.3	-0.2	-0.5	-2.0	-2.0	-1.0

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

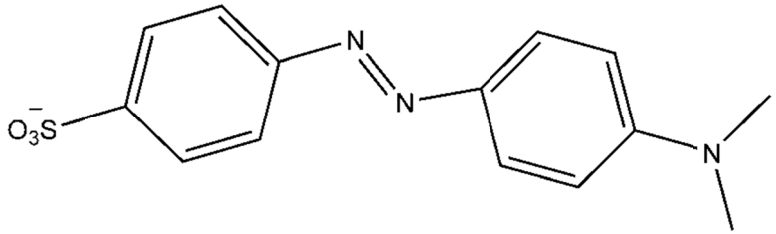
Table S38 Comparison of Solid state ^{13}C NMR shifts for B-N-O-H nanofoams, Methyl orange, B-N-O-H nanofoams after being charged in 600mgL^{-1} Methyl orange at 0 V and 1.2 V, respectively.



Samples	Chemical shifts of C atoms / ppm						
	C*-1	**C*-2**	**C*-3**	**C*-4**	**C*-5**	**C*-6**	**C*-7**
B-N-O-H nanofoams	-	-	-	-	-	-	-
Methyl orange	151.0	148.0	141.0	125.0	120.5	111.0	38.7
0V**	150.7	147.8	140.6	124.7	120.2	110.8	38.5
1.2V**	150.5	141.5	140.3	124.5	119.9	110.6	.8.3
Δδ (0 V- B-N-O-H nanofoams)	-	-	-	-	-	-	-
Δδ (0 V- Methyl orange)	-0.3	-0.2	-0.4	-0.3	-0.3	-0.2	-0.2
Δδ (1.2V- 0 V)	-0.2	-0.3	-0.3	-0.2	-0.3	-0.2	-0.2

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

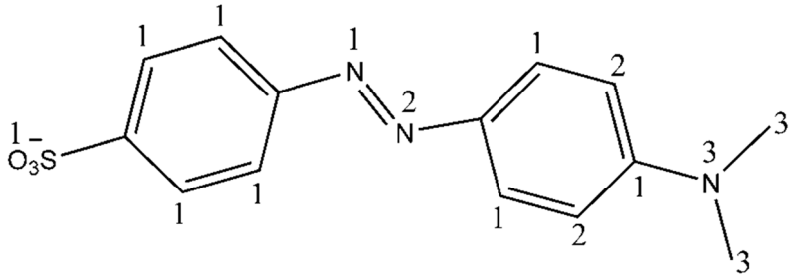
Table S39 Comparison of Solid state ^{11}B NMR shifts for B-N-O-H nanofoams, Methyl orange, B-N-O-H nanofoams after being charged in 600mgL^{-1} Methyl orange at 0 V and 1.2 V, respectively.



Samples	**Chemical shifts of B atoms / ppm**						
	BN_3	**BN_3**	**BO_3**	**BO_3**	**BO_4**	**BN_4**	**BH_2**
B-N-O-H nanofoams	19.2	16.0	15.7	12.5	6.0	1.7	-4.0
Methyl orange	-	-	-	-	-	-	-
0V**	19.0	15.8	15.5	12.3	5.8	1.5	-4.2
1.2V**	18.9	15.6	15.4	12.2	5.6	1.4	-4.4
Δδ (0 V- B-N-O-H nanofoams)	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Δδ (0 V- Methyl orange)	-	-	-	-	-	-	-
Δδ (1.2V- 0 V)	-0.1	-0.2	-0.1	-0.1	-0.2	-0.1	-0.2

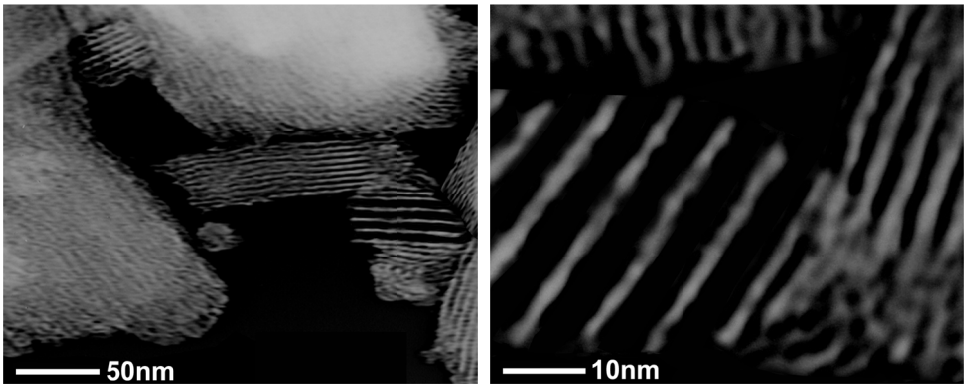
Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.

Table S40 Comparison of Solid state ^{1}H NMR shifts for B-N-O-H nanofoams, Methyl orange, B-N-O-H nanofoams after being charged in 600mgL^{-1} Methyl orange at 0 V and 1.2 V, respectively.



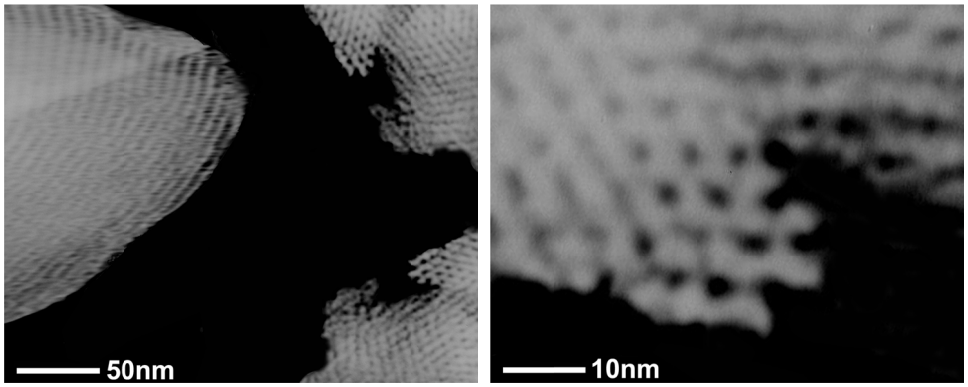
Samples	**Chemical shifts of H atoms / ppm**									
	HO	**$HN_{1/2}$**	**HN*-1**	**HN*-2**	**HN*-3**	**$HB_{1/2}$**	**H*-3**	**H*-2**	**H*-3**	**HO*-1**
B-N-O-H nanofoams	15.69	15.42	-	-	-	15.00	-	-	-	-
Methyl orange	-	-	-	-	-	-	7.60	6.80	2.92	-
0V**	15.67	15.40	15.23	15.19	15.12	14.98	7.58	6.78	2.90	3.63
1.2V**	15.66	15.39	15.22	15.18	15.11	14.97	7.56	6.76	2.87	3.60
Δδ (0 V- B-N-O-H nanofoams)	-0.02	-0.02	-	-	-	-0.02	-	-	-	-
Δδ (0 V- Methyl orange)	-	-	-	-	-	-	-0.02	-0.02	-0.02	-
Δδ (1.2V- 0 V)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03

Note: * indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions;
** means the B-N-O-H nanofoams charged at those voltages in the 600mgL^{-1}dyes.



a b

Fig.S1 (a) Low resolution and (b) high resolution of the cross-sectional STEM images for the as-prepared B-N-O-H nanofoams obtained via ultrathin paraffin-embedded section.



a b

Fig.S2 (a) Low resolution and (b) high resolution STEM images of the hexagonal patterns along the pore axis for the mesoporous CuB_{23} hosts obtained via ultrathin paraffin-embedded section. (The surface structure of the mesoporous CuB_{23} was not visible directly via STEM without ultrathin paraffin-embedded section, which is due to its unique dielectric properties).

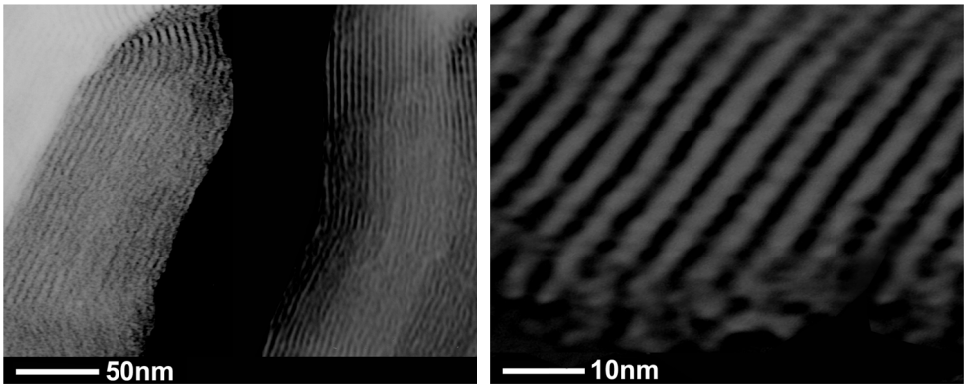


Fig.S3 (a) Low resolution and (b) high resolution of the cross-sectional STEM images for the mesoporous CuB_{23} hosts obtained via ultrathin paraffin-embedded section. (The surface structure of the mesoporous CuB_{23} was not visible directly via STEM without ultrathin paraffin-embedded section, which is due to its unique dielectric properties).

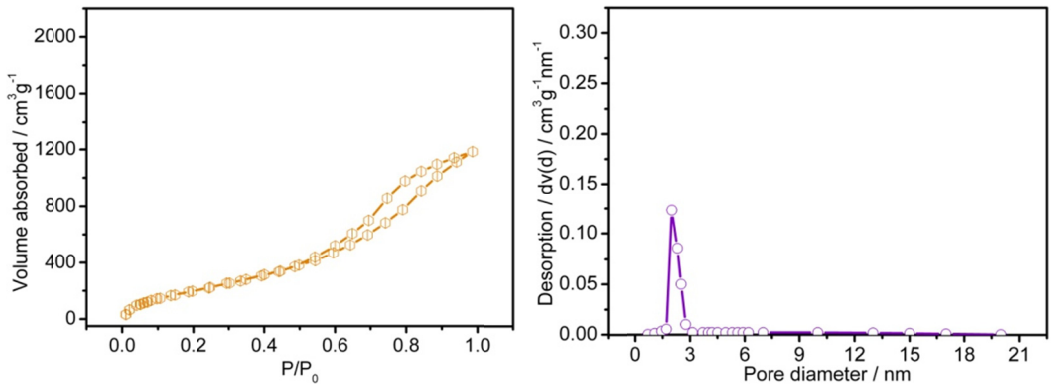


Fig.S4 (a) N_2 adsorption–desorption plots and (b) pore size distribution of the mesoporous CuB_{23} hosts.

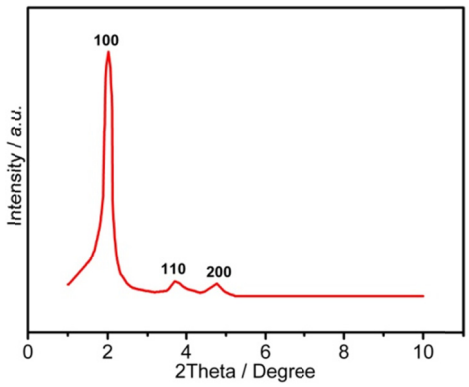


Fig.S5 The small angle XRD pattern of the mesoporous CuB_{23} hosts.

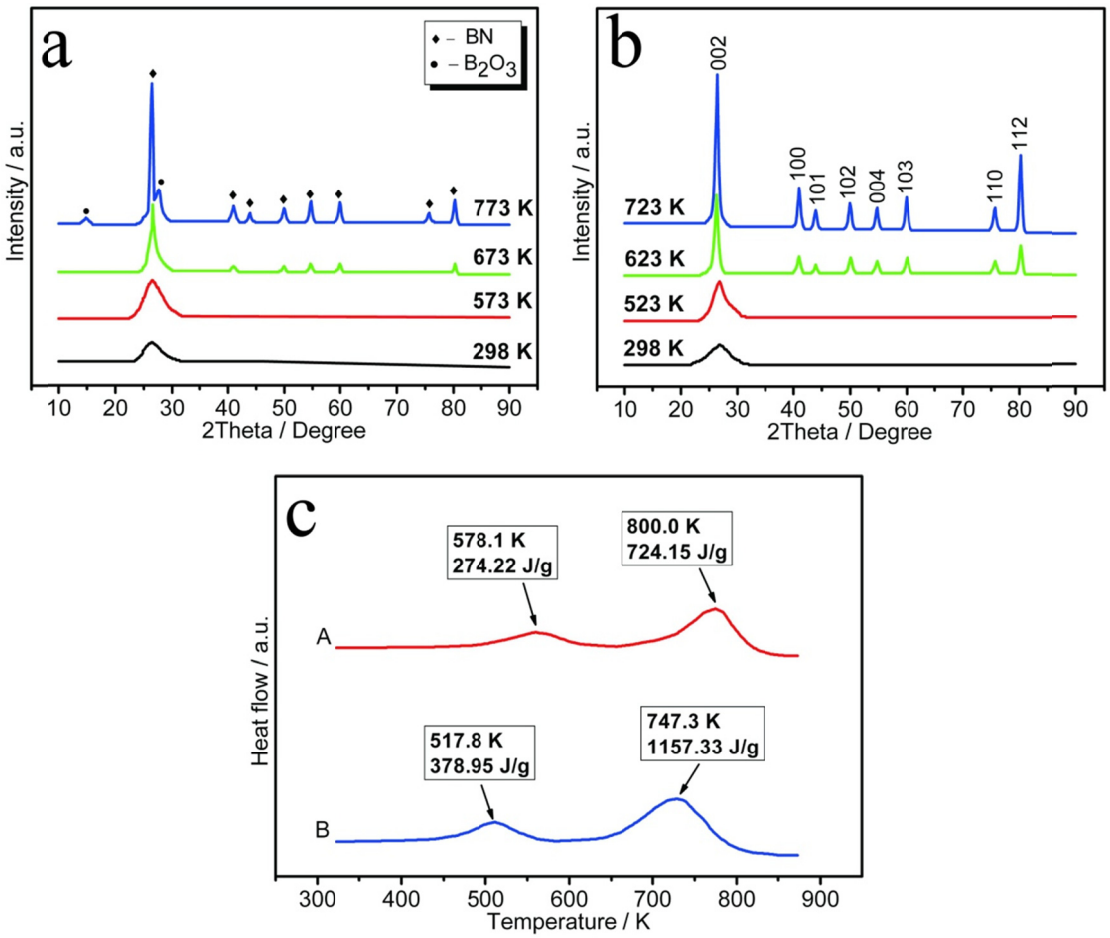


Fig.S6 (a) XRD pattern of the as-prepared amorphous B-N-O-H nanofoams treated at different temperatures under Argon atmosphere; (b) XRD pattern of the as-prepared amorphous BN treated at different temperatures under Argon atmosphere; (c) DSC profiles of the as-prepared amorphous (A) B-N-O-H nanofoams and (B) BN.

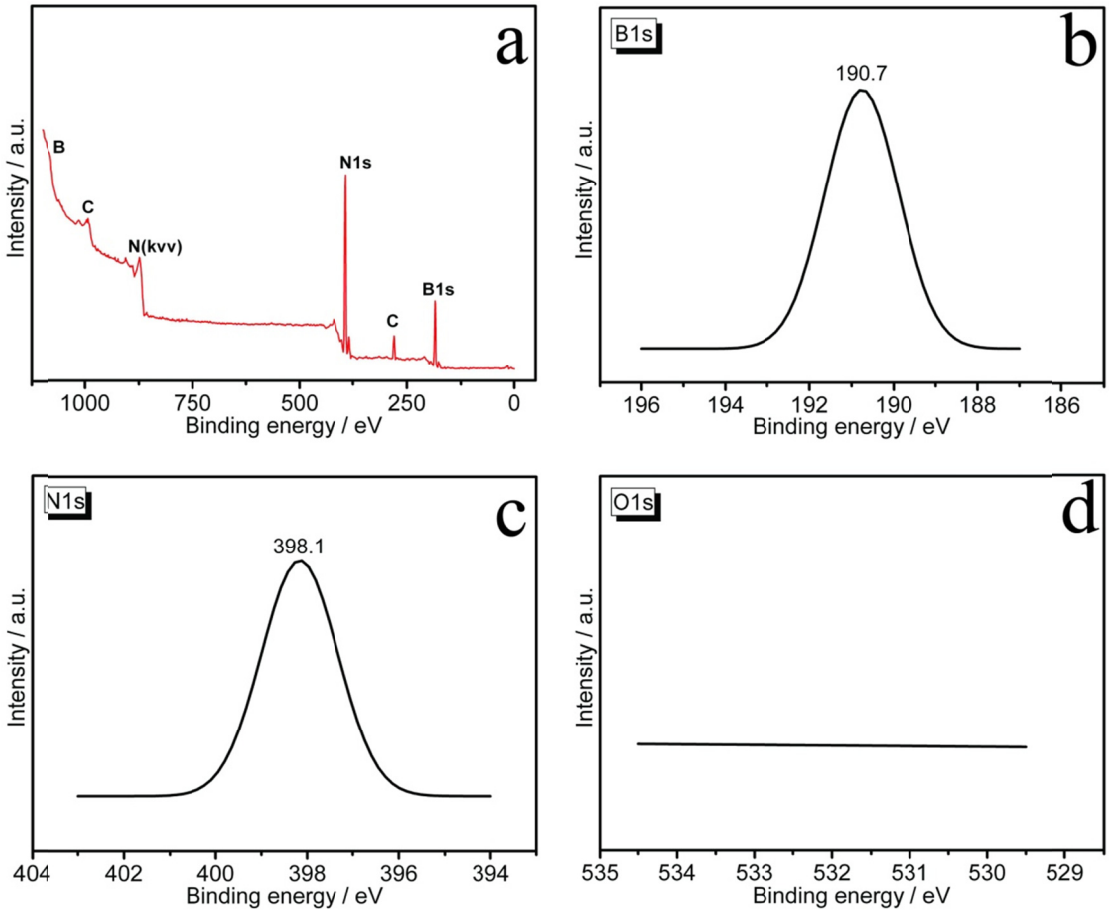


Fig.S7 XPS spectra for the as prepared amorphous BN (a) survey spectrum; (b) B 1s; (c) N 1s and (d) O 1s spectra.

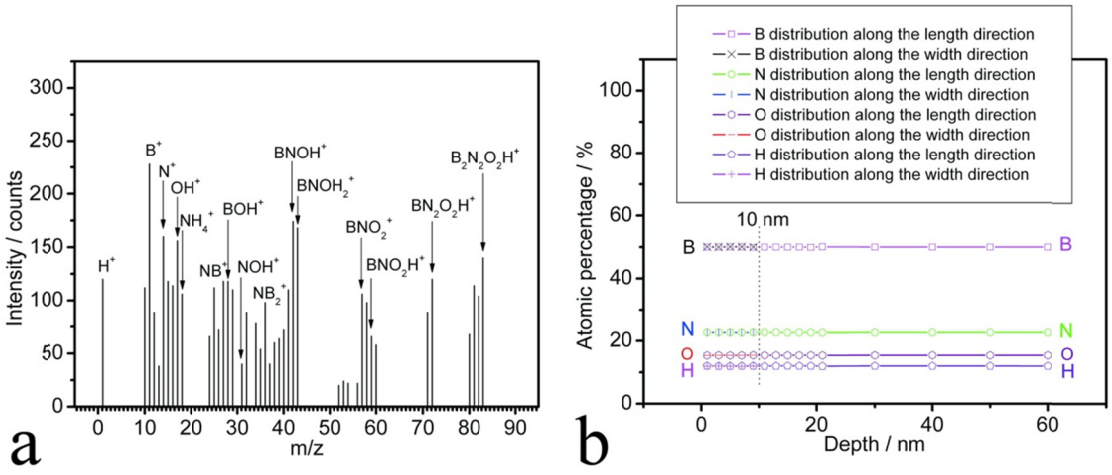


Fig.S8 ToF-SIMS spectra of (a) the as-prepared amorphous B–N–O–H nanofoams and (b) the depth distribution of B, N, O and H along the width direction (0-10nm) and length direction (0-60nm) of B–N–O–H nanofoams obtained from the ToF-SIMS depth profiles.

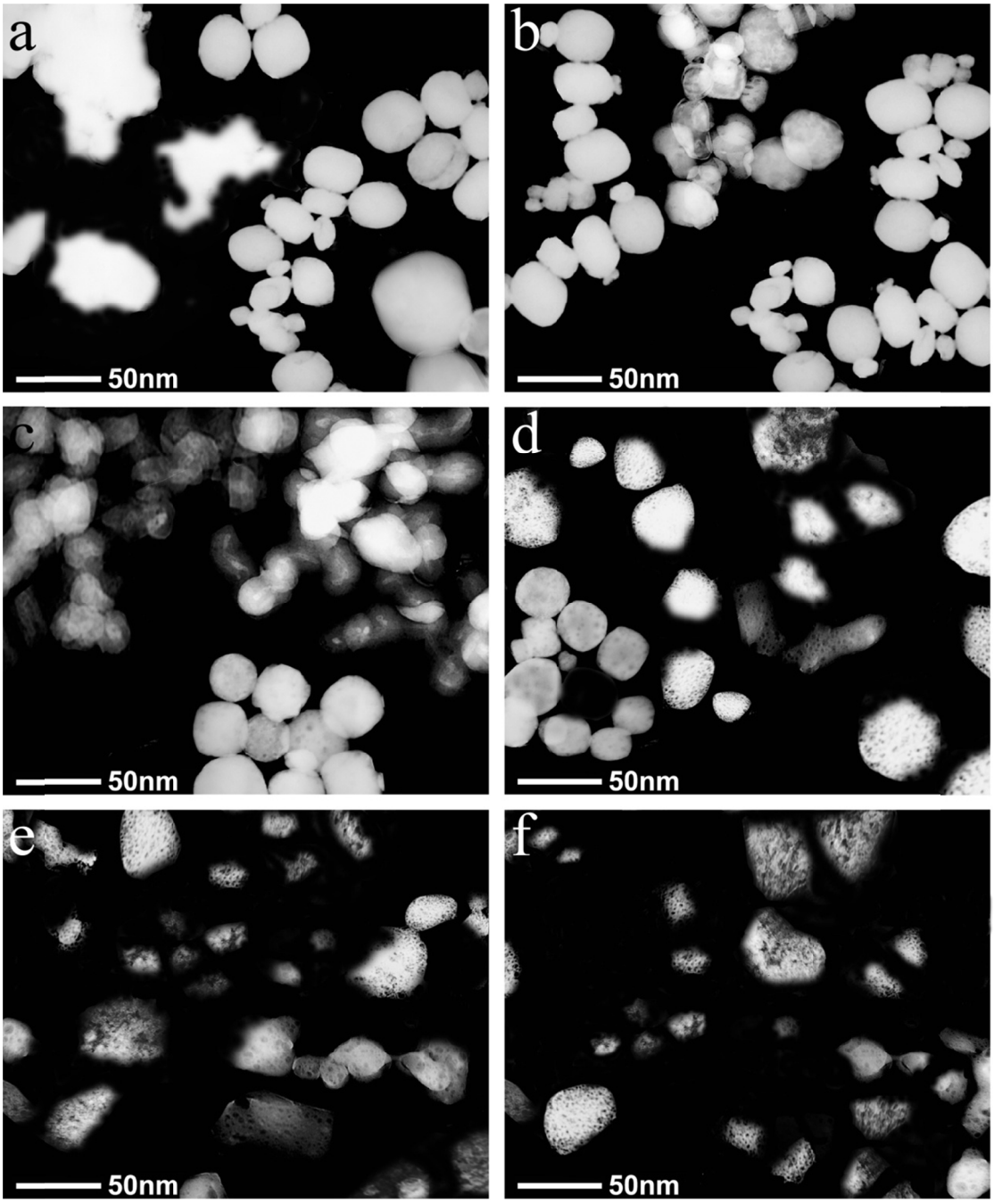


Fig.S9 STEM images of the as-prepared amorphous B–N–O–H nanofoams during SPT: (a) 0 min, (b) 0.5 min; (c) 1 min; (d) 2 min; (e) 5 min and (f) 10 min.

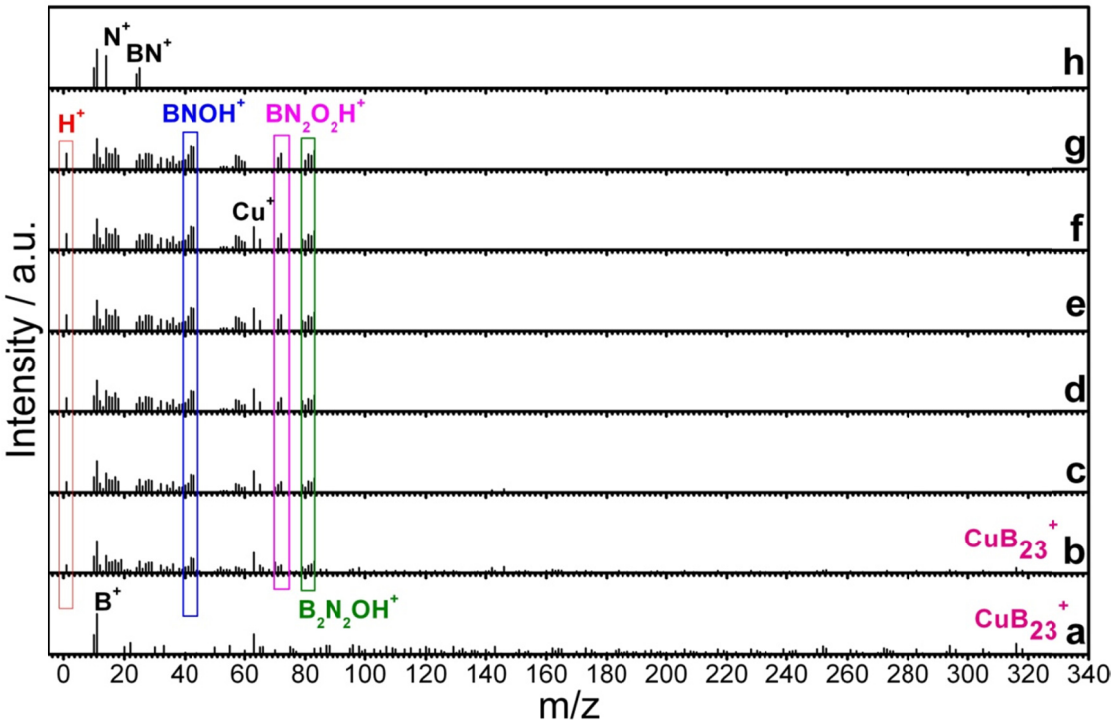


Fig.S10 ToF-SIMS spectra of the as-prepared amorphous B-N-O-H nanofoams during SPT: (a) 0 min, (b) 0.5 min; (c) 1 min; (d) 2 min; (e) 5 min; (f) 10 min; (g) 10 min after acid wash and (h) commercial BN.

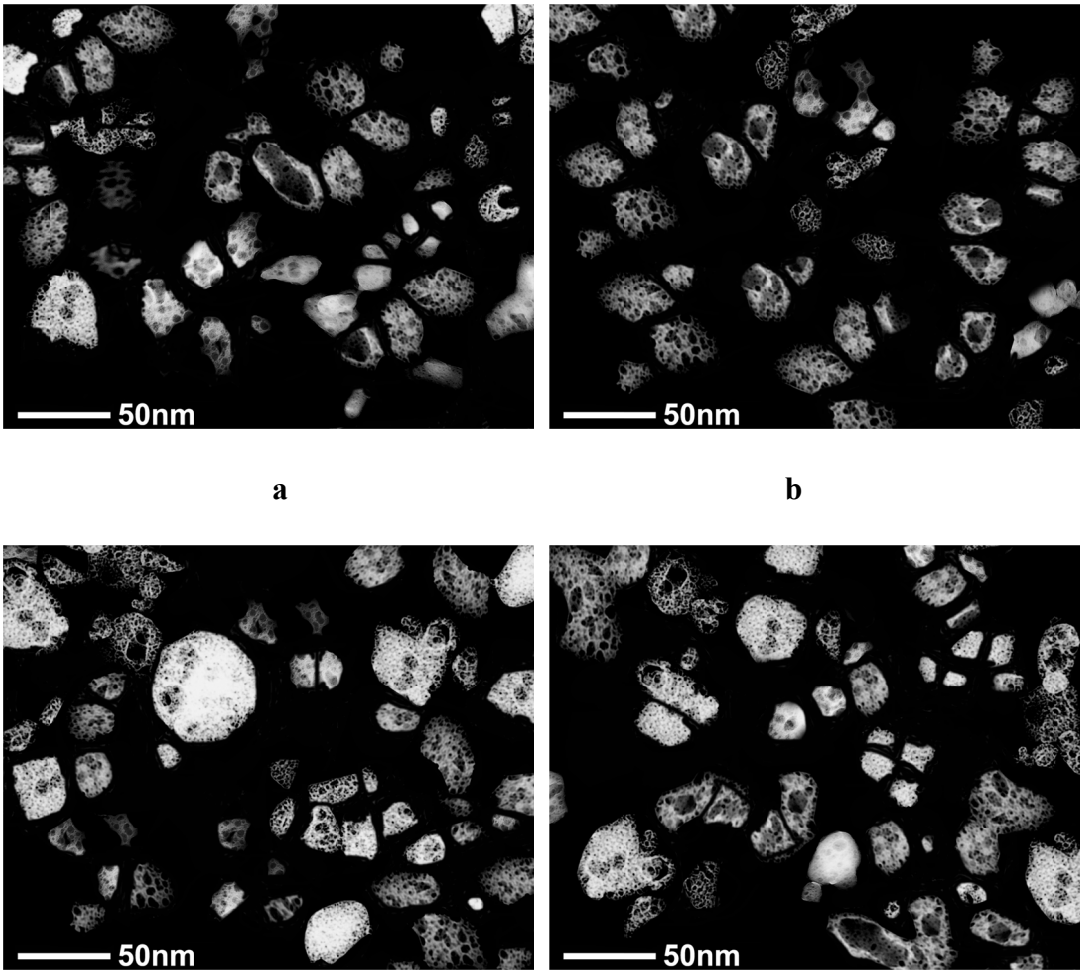


Fig.S11 STEM images of B-N-O-H nanofoams prepared with (a) 30 mL [BMIM][BF_4]; (b) 30 mL [BMIM]Cl; (c) 50 mL [BMIM][PF_6]; (d) 100 mL [BMIM][PF_6].

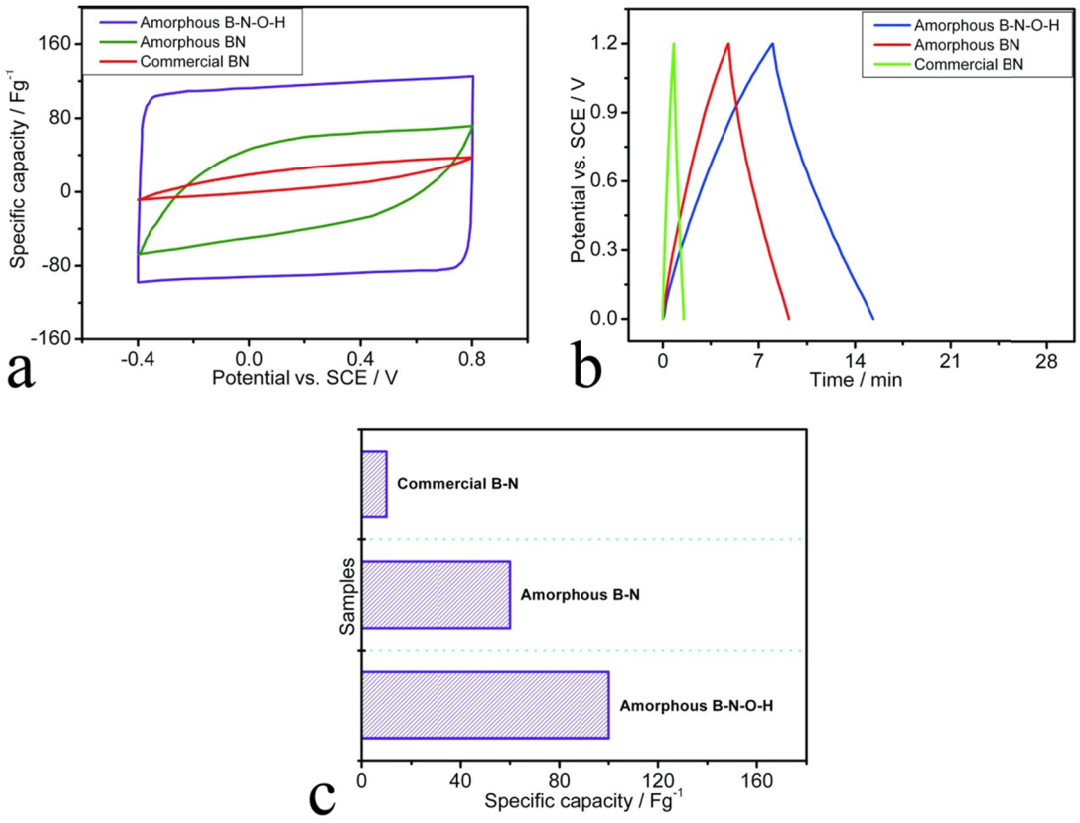


Fig.S12 (a) CV curves of amorphous B-N-O-H prepared in this work, amorphous BN prepared in this work and commercial BN at 5 mVs^{-1} in 600 mgL^{-1} MB aqueous solution; (b) Charge-discharge profiles of amorphous B-N-O-H prepared in this work, amorphous BN prepared in this work and commercial BN at 0.2 $mAcm^{-2}$ in 600 mgL^{-1} MB aqueous solution; and (c) Specific capacity of amorphous B-N-O-H prepared in this work, amorphous BN prepared in this work and commercial BN at 0.2 $mAcm^{-2}$ in 600 mgL^{-1} MB aqueous solution.

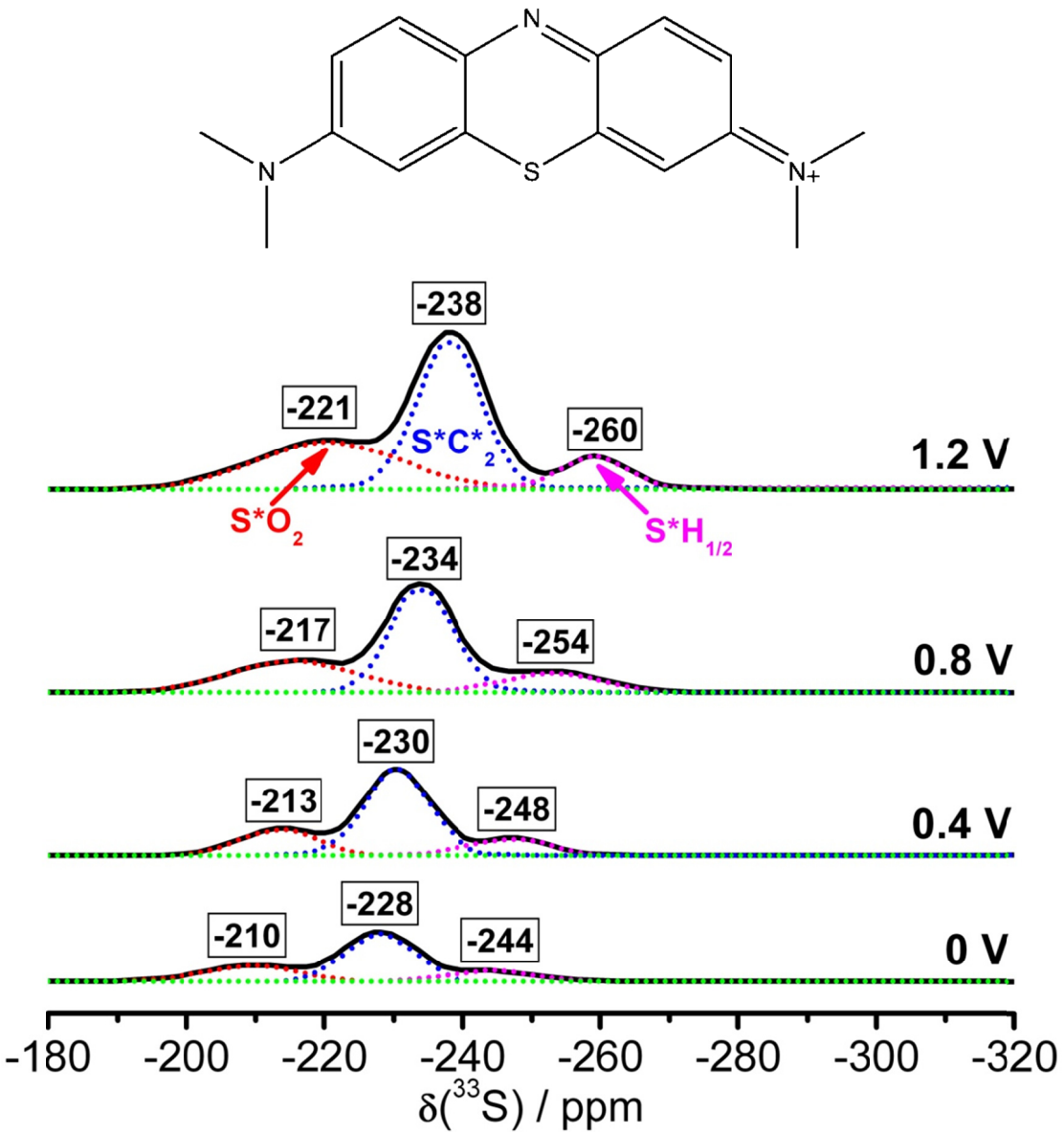


Fig.S13 Solid state ^{33}S NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

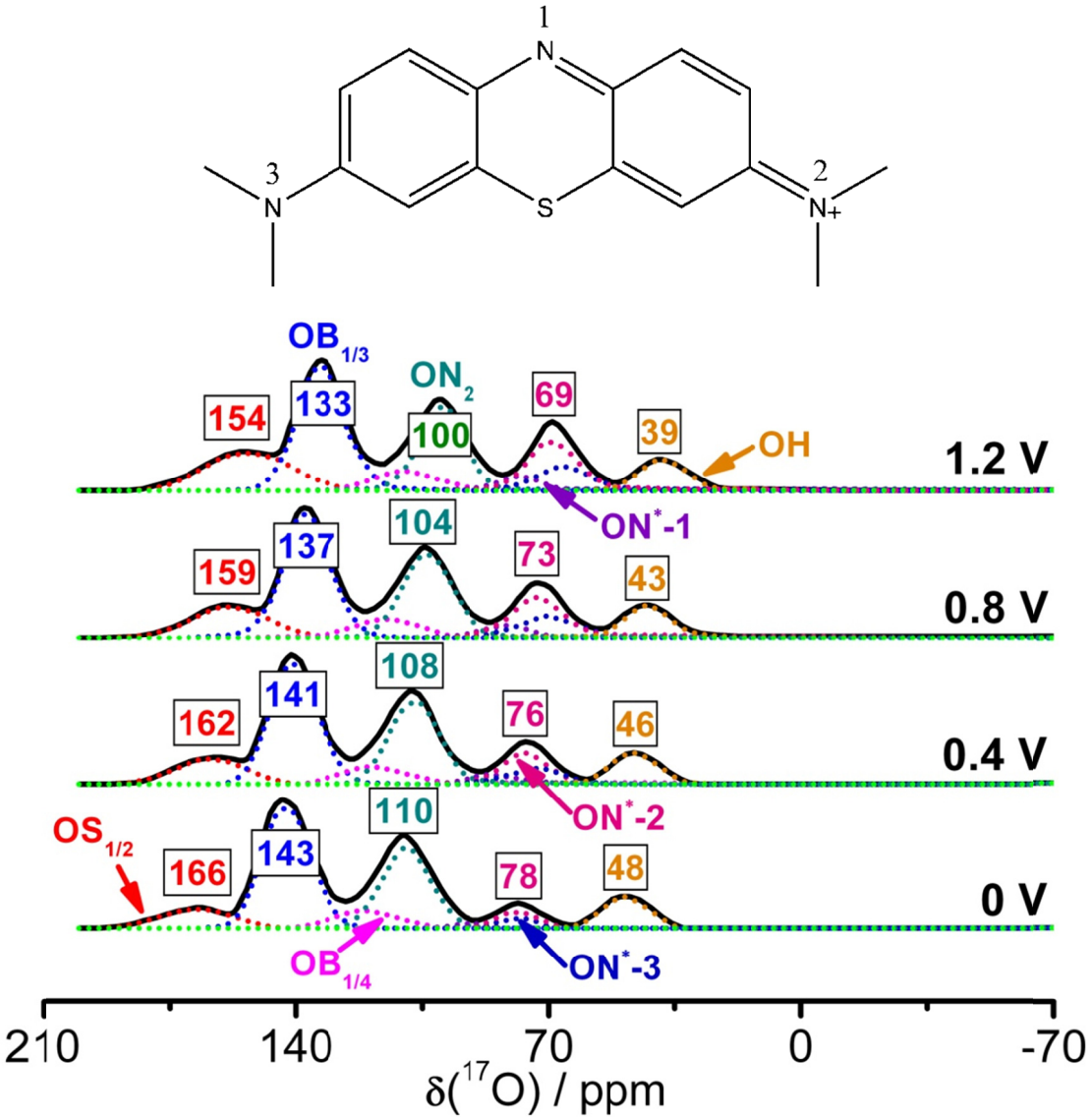


Fig.S14 Solid state ^{17}O NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

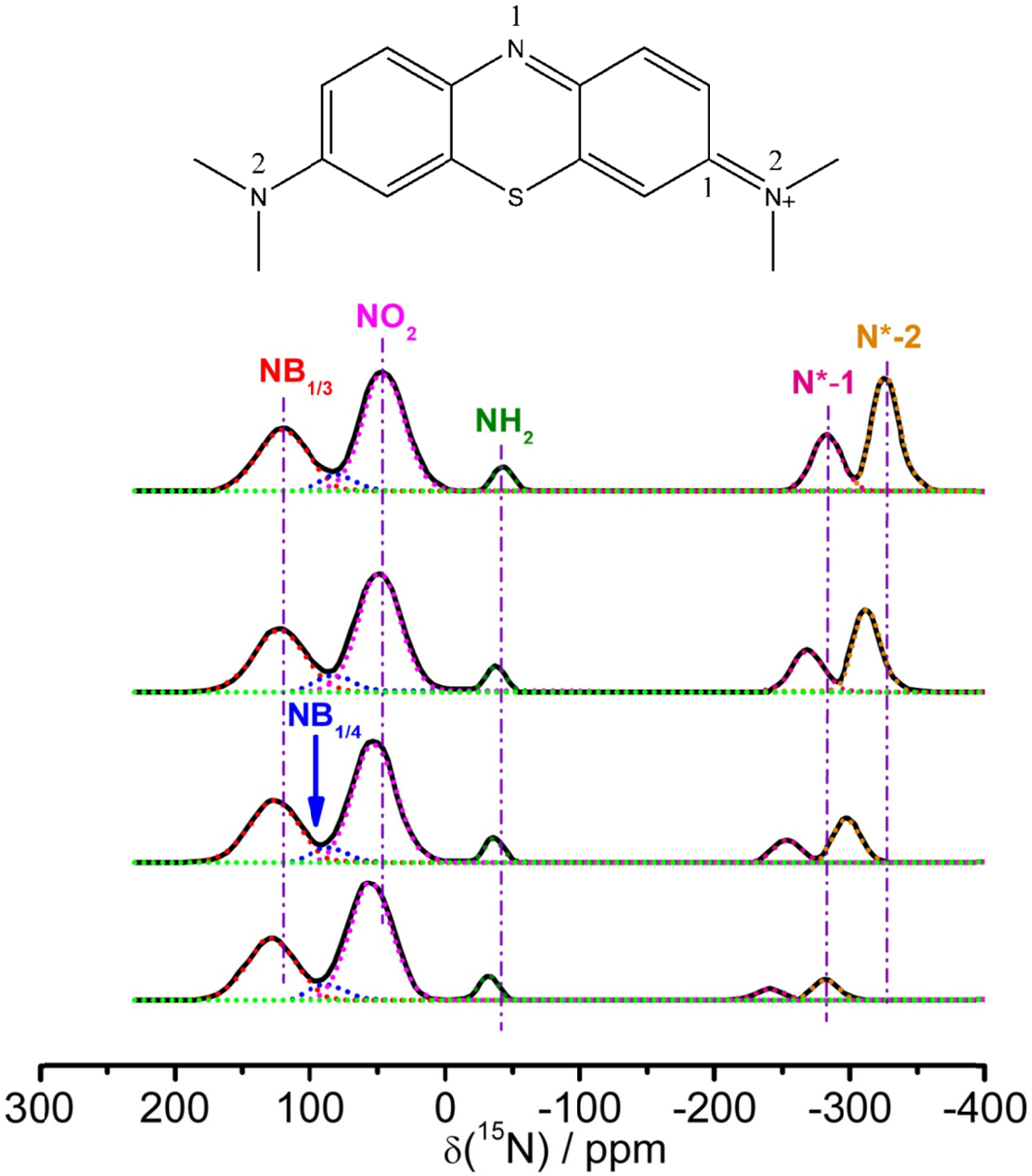


Fig.S15 Solid state ^{15}N NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

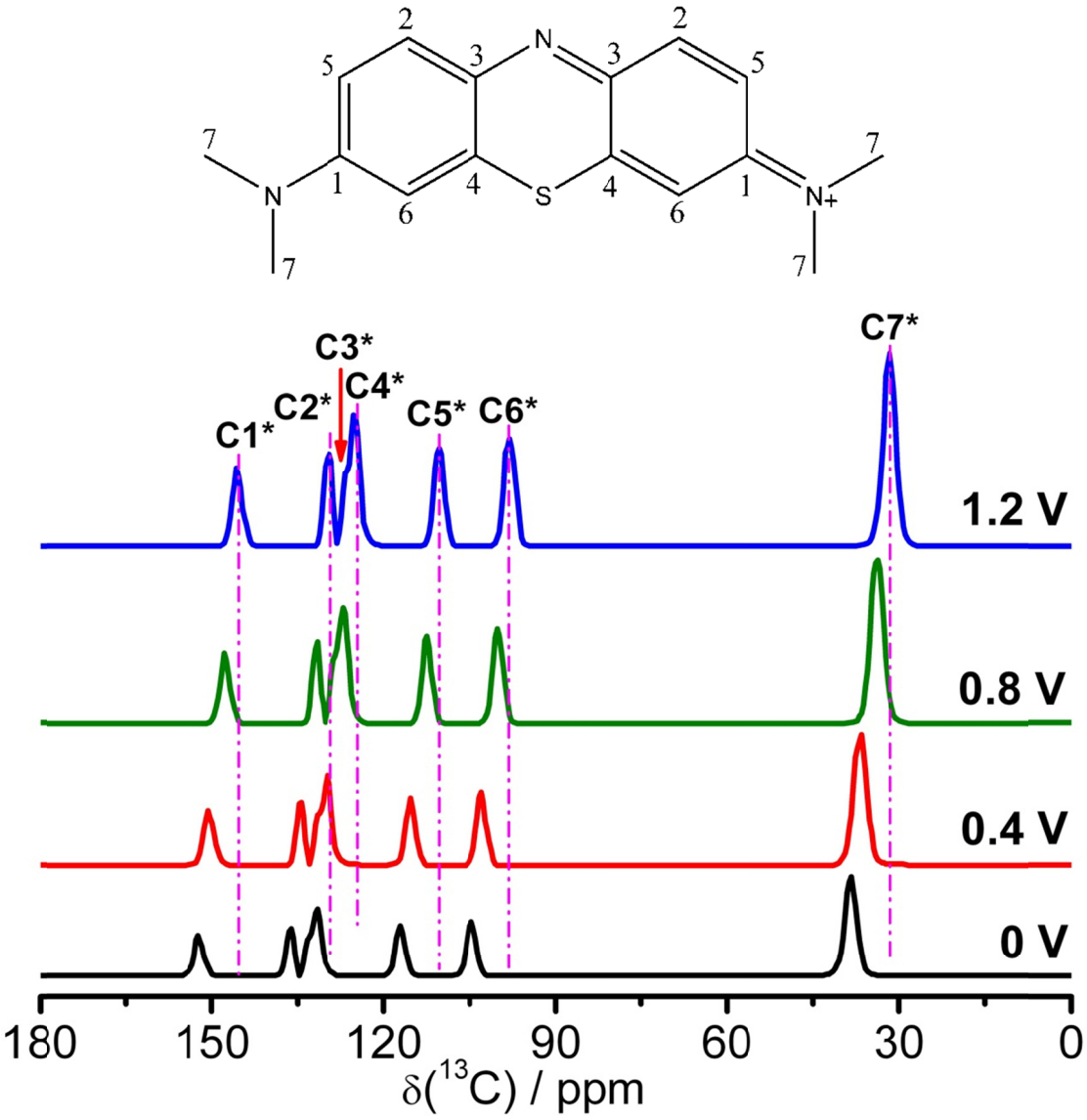


Fig.S16 Solid state ^{13}C NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

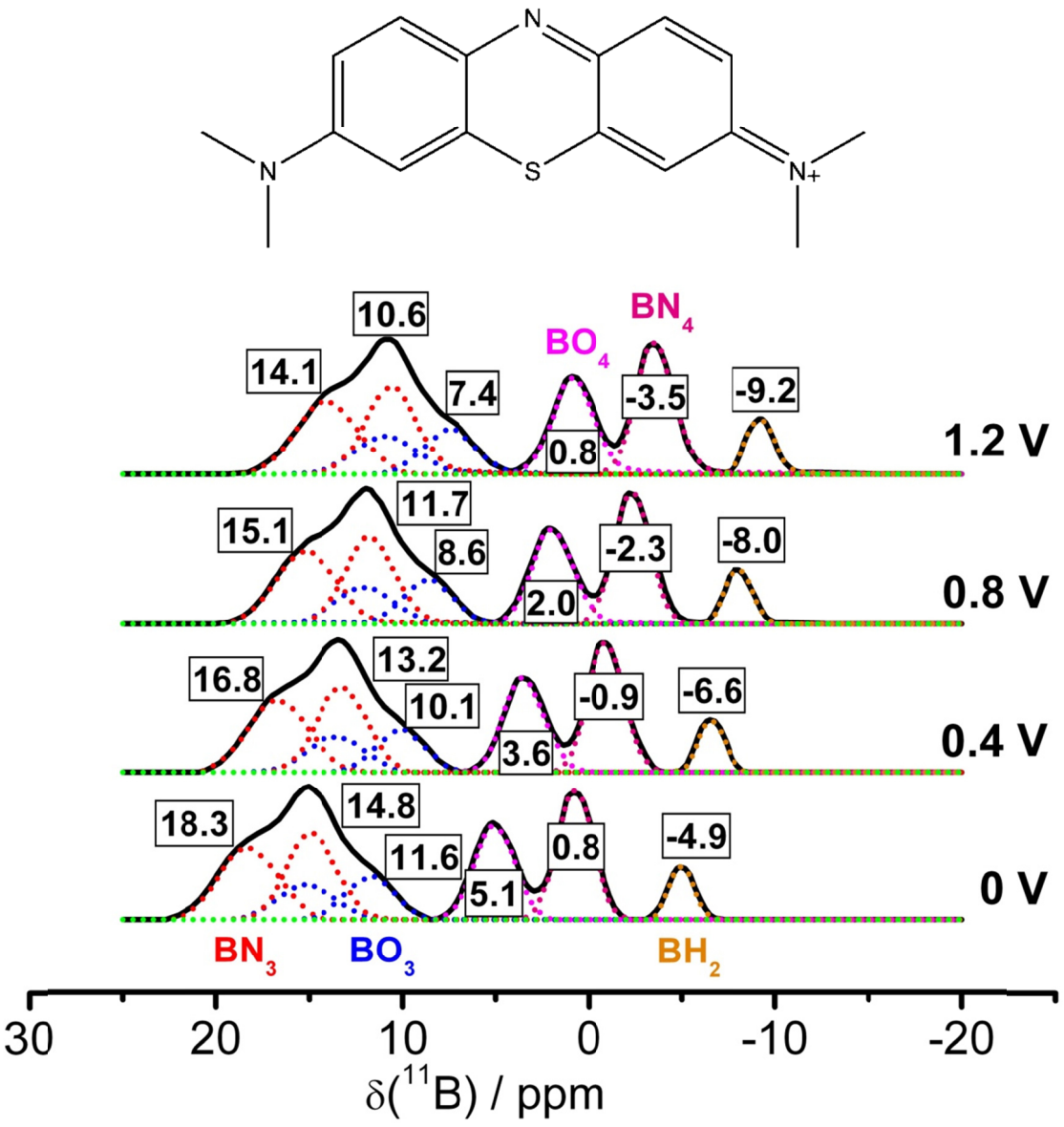


Fig.S17 Solid state ^{11}B NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

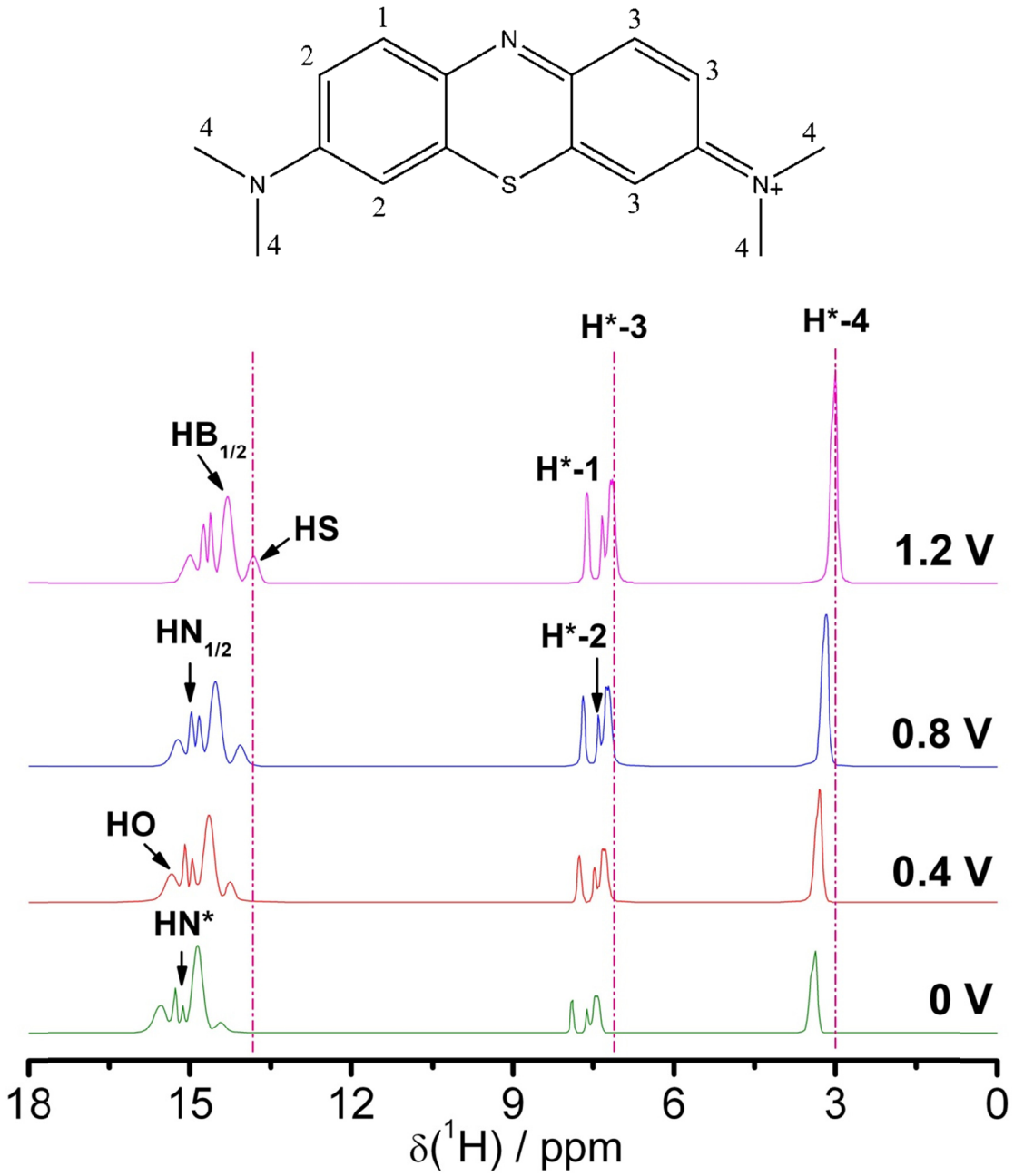


Fig.S18 Solid state ^{1}H NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

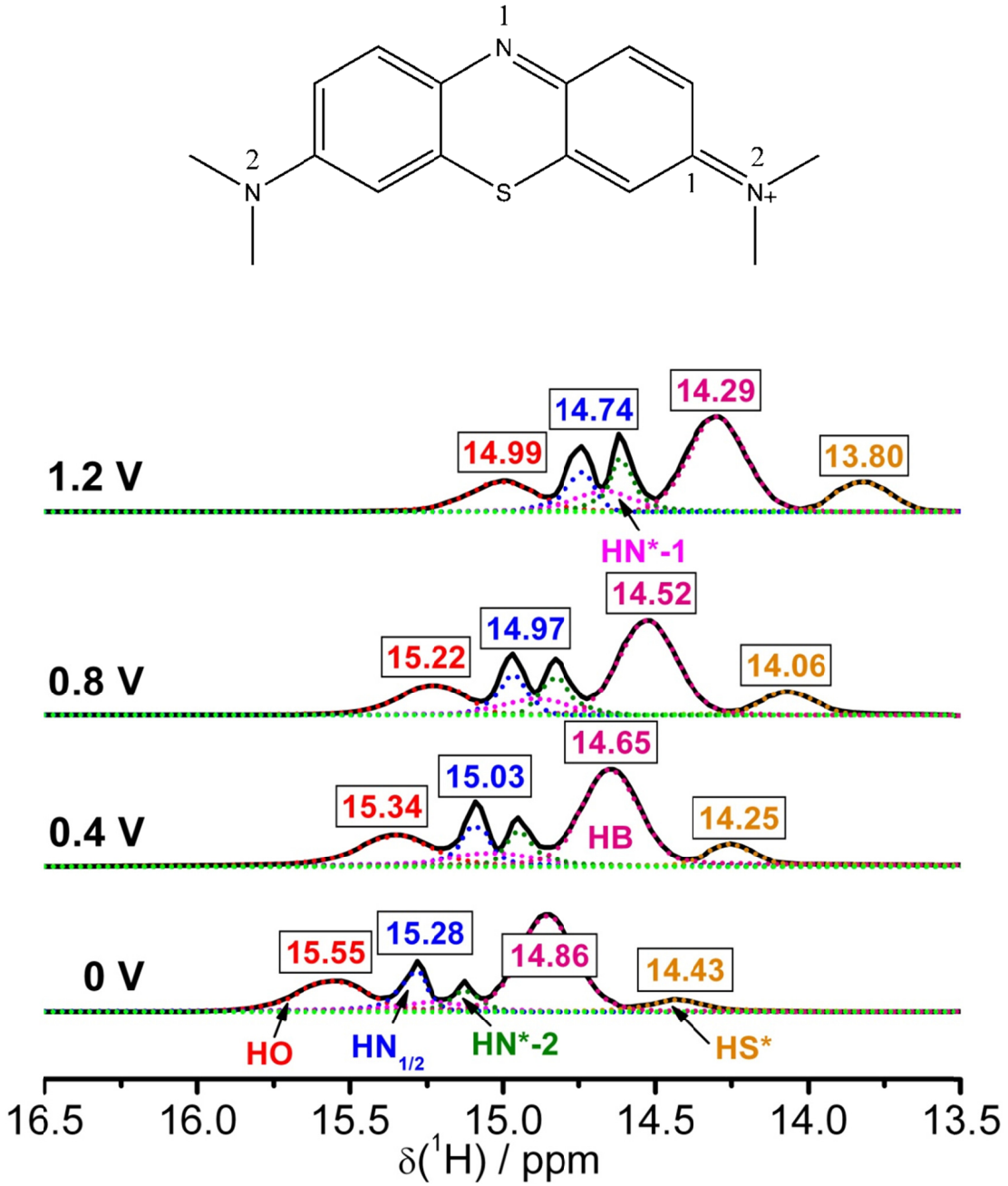


Fig.S19 Solid state ^{1}H NMR of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages. (* indicates the atoms from the dye ions; the number behind them corresponding to their location in the dye ions)

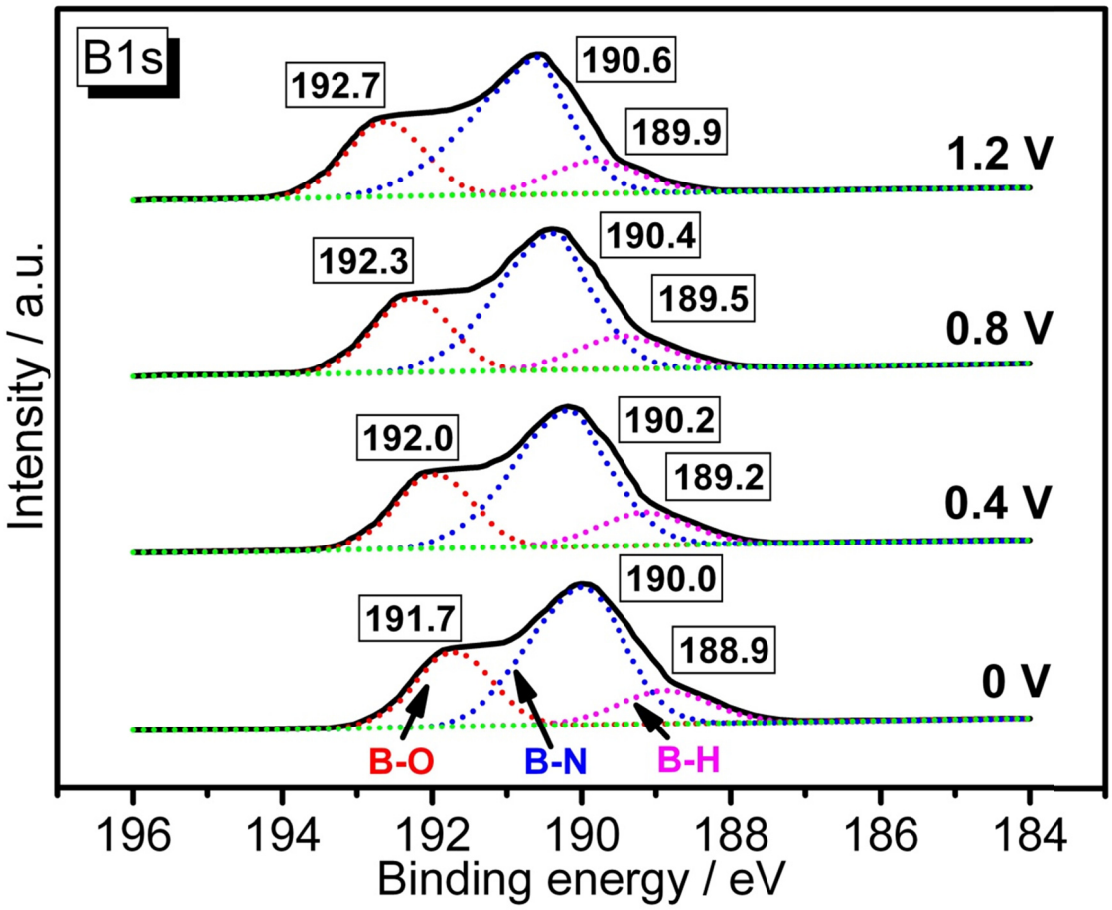


Fig.S20 B 1s XPS of amorphous B-N-O-H nanofoams after being charged in 600mgL^{-1} MB at different voltages.

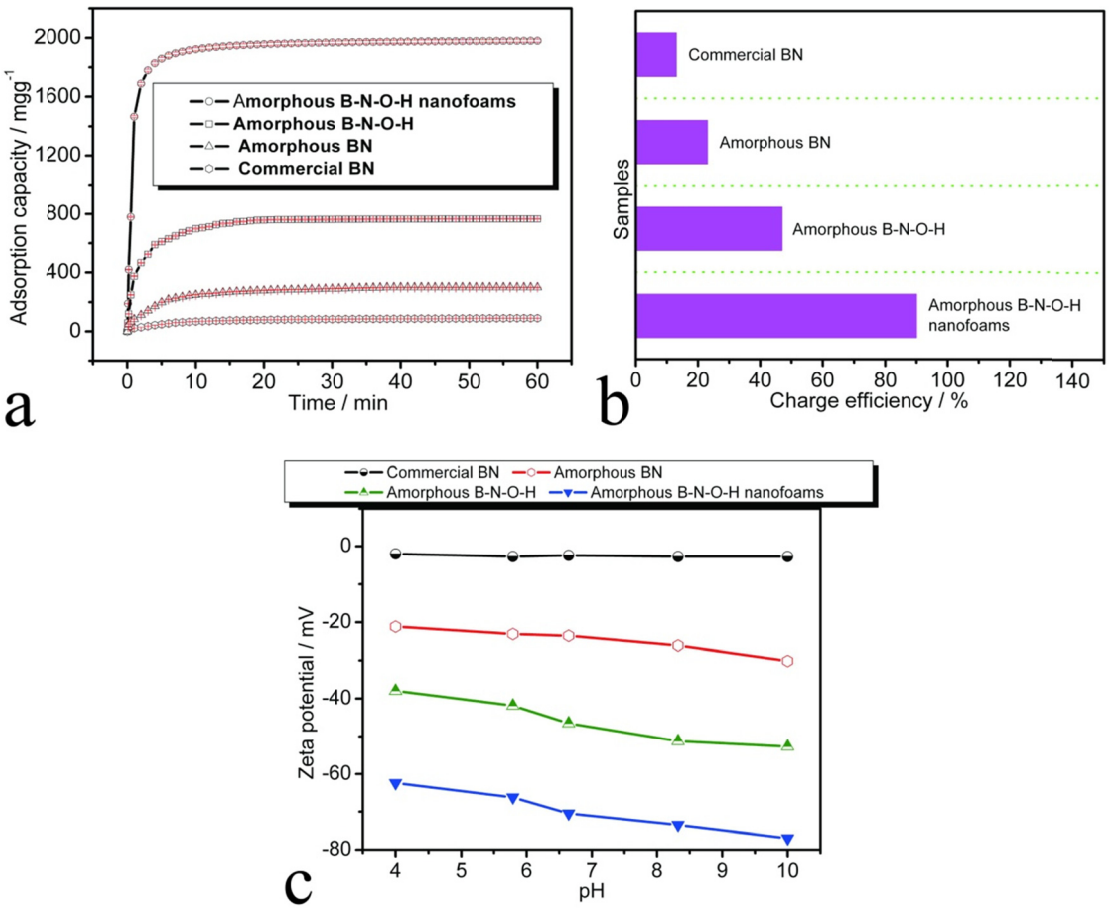


Fig.S21 (a) The MB electrosorption capacity vs. time profiles (the red mark represents error bars of capacity); (b) Charge efficiency and (c) Zeta potential vs. pH profiles for amorphous B-N-O-H nanofoams, amorphous B-N-O-H, amorphous BN and commercial BN, respectively.

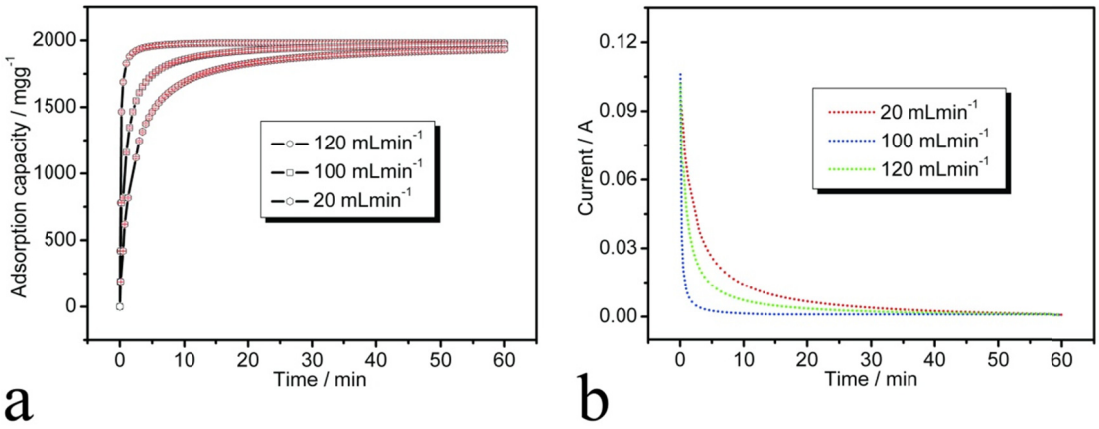


Fig.S22 Effect of flow rate on (a) electro-adsorption capacity (the red mark represents error bars of capacity) and (b) I-t relationships of B-N-O-H nanofoams.

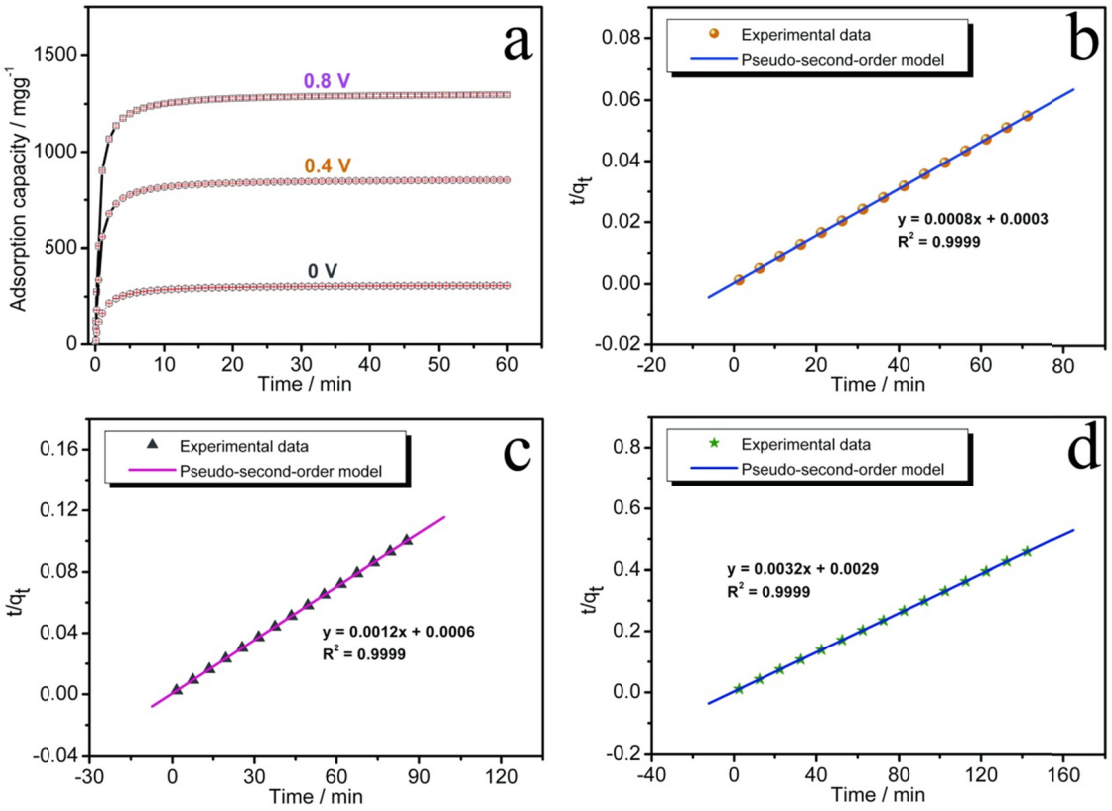


Fig.S23 (a) Electro-adsorption isotherm on B-N-O-H-nanofoams towards 600 mgL^{-1} MB aqueous solution at different Bias potentials (the red mark represents error bars of capacity); (b) The pseudo-second-order electro-adsorption kinetics fitting for MB over B-N-O-H-nanofoams at 0.8 V; (c) The pseudo-second-order electro-adsorption kinetics fitting for MB over B-N-O-H-nanofoams at 0.4 V; and (d) The pseudo-second-order electro-adsorption kinetics fitting for MB over B-N-O-H-nanofoams at 0 V.

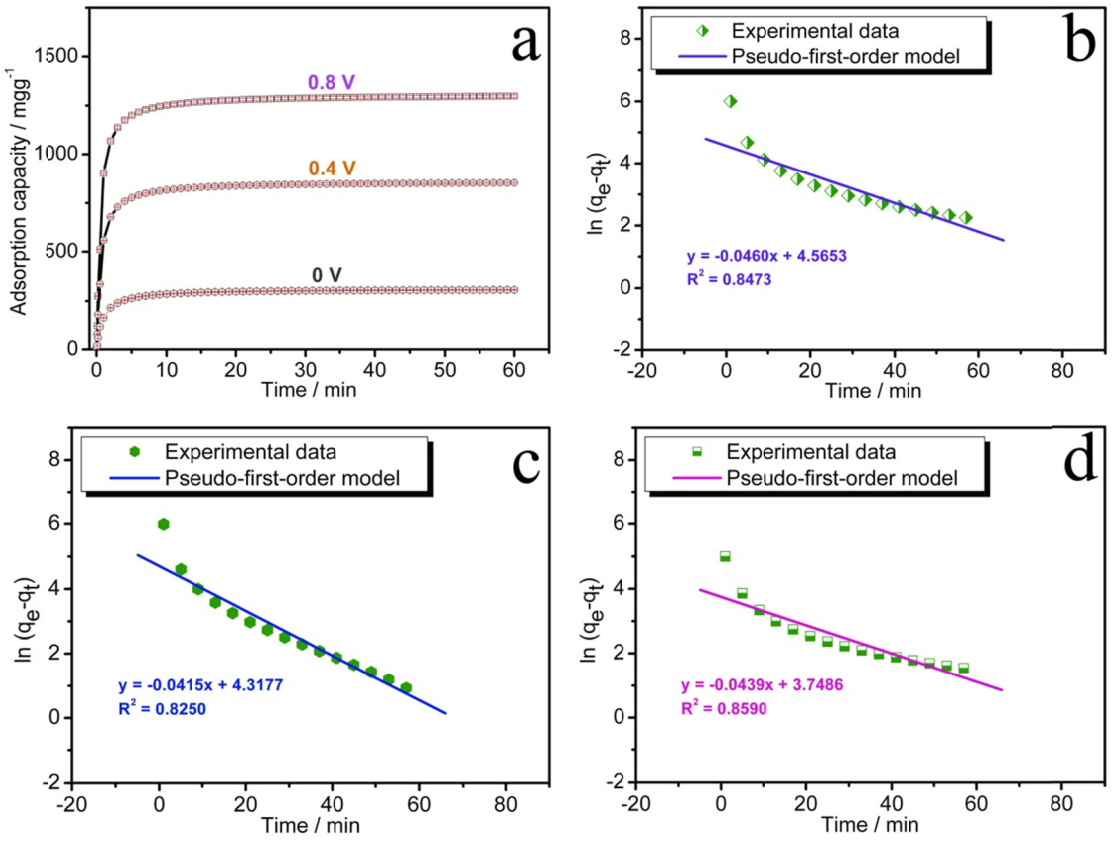


Fig.S24 (a) Electro-adsorption isotherm on B-N-O-H-nanofoams towards 600 mgL^{-1} MB aqueous solution at different Bias potentials (the red mark represents error bars of capacity); (b) The pseudo-first-order electrosorption kinetics fitting for MB over B-N-O-H-nanofoams at 0.8 V; (c) The pseudo-first-order electrosorption kinetics fitting for MB over B-N-O-H-nanofoams at 0.4 V; and (d) The pseudo-first-order electrosorption kinetics fitting for MB over B-N-O-H-nanofoams at 0 V.

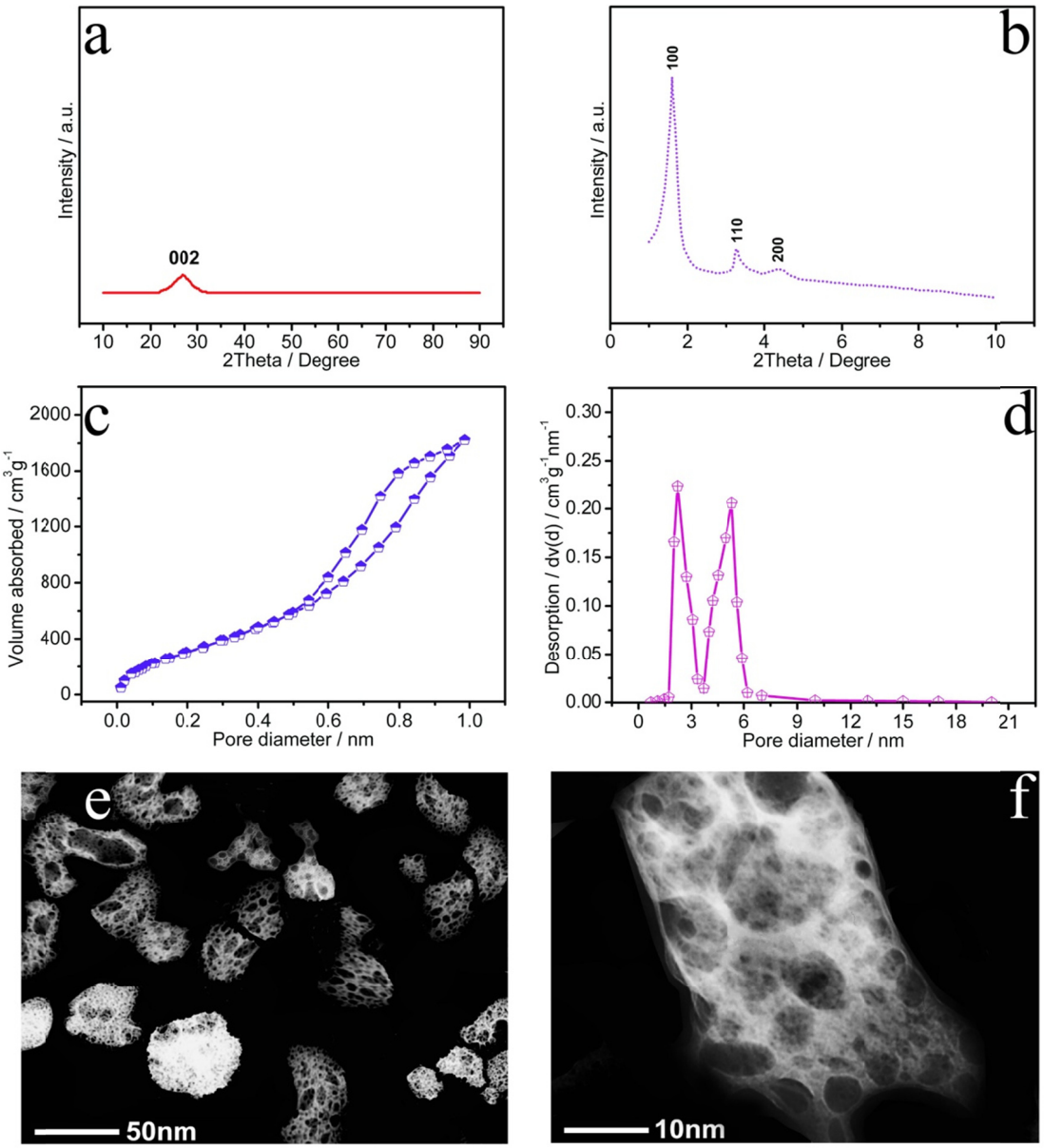


Fig.S25 (a) XRD profile, (b) Small angle XRD profile, (c) Nitrogen sorption isotherm, (d) Pore size distribution, (e) STEM image and (f) enlarged STEM image of B-N-O-H nanofoams after 10 cycles.

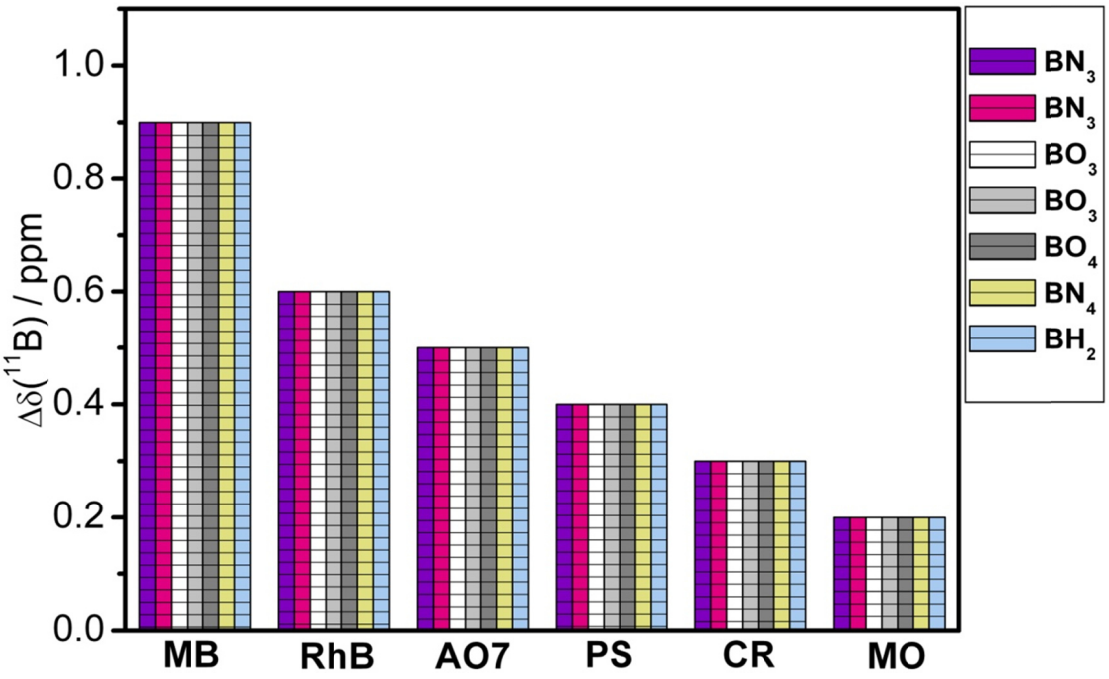


Fig.S26 Solid state ^{11}B NMR shifts for B-N-O-H nanofoams before and after adsorbing different dyes.

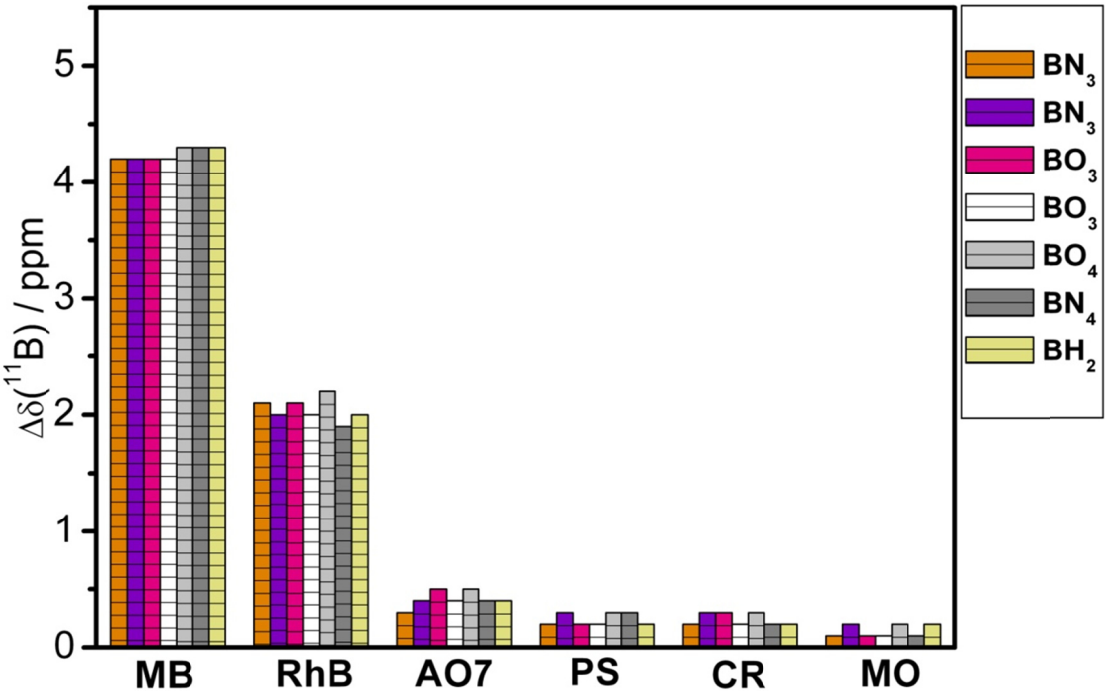


Fig.S27 Solid state ^{11}B NMR shifts for B-N-O-H nanofoams after being charged in 600mgL^{-1} different dyes at 0 V and 1.2 V, respectively.

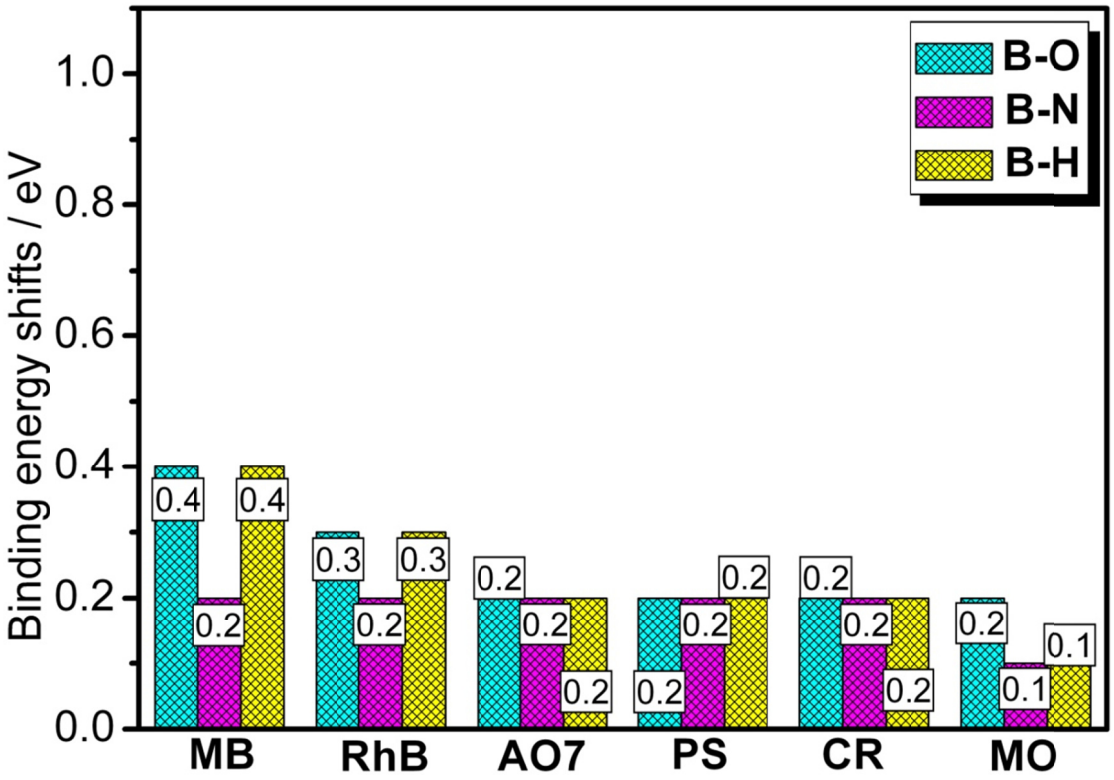


Fig.S28 Binding energy shifts of B 1s for B-N-O-H nanofoams before and after adsorbing different dyes.

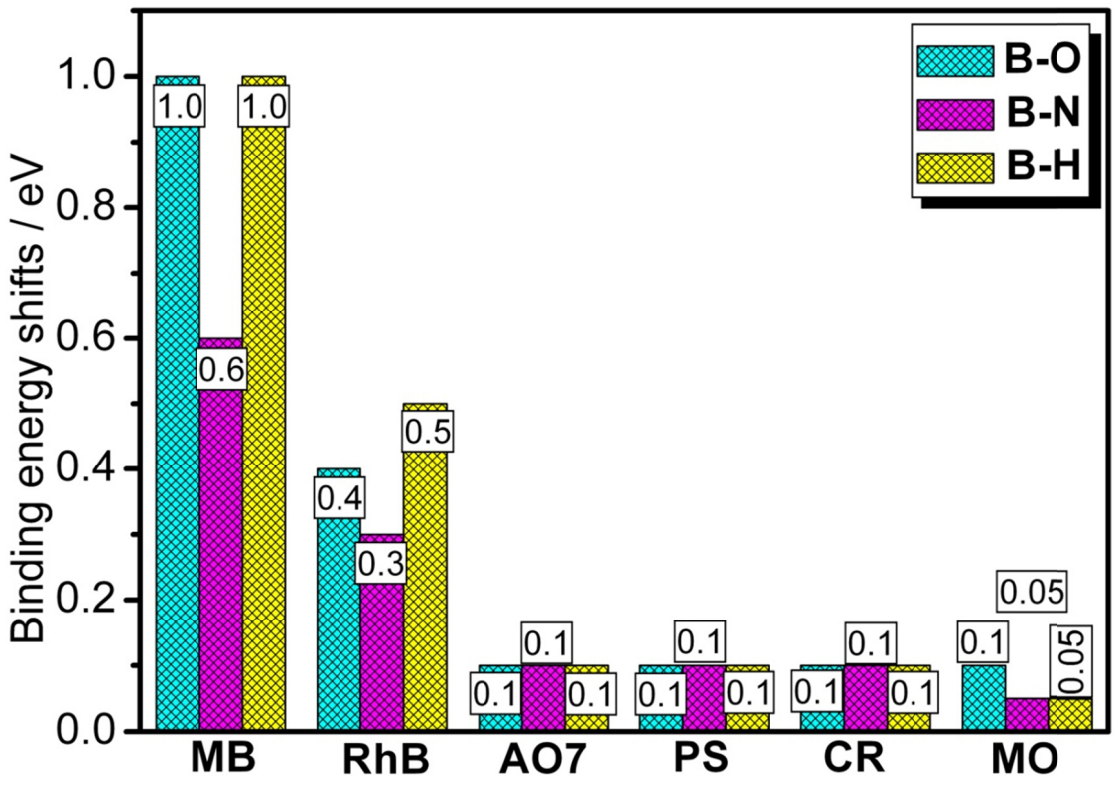


Fig.S29 Binding energy shifts of B 1s for B-N-O-H nanofoams after being charged in 600mgL^{-1} different dyes at 0 V and 1.2 V, respectively.

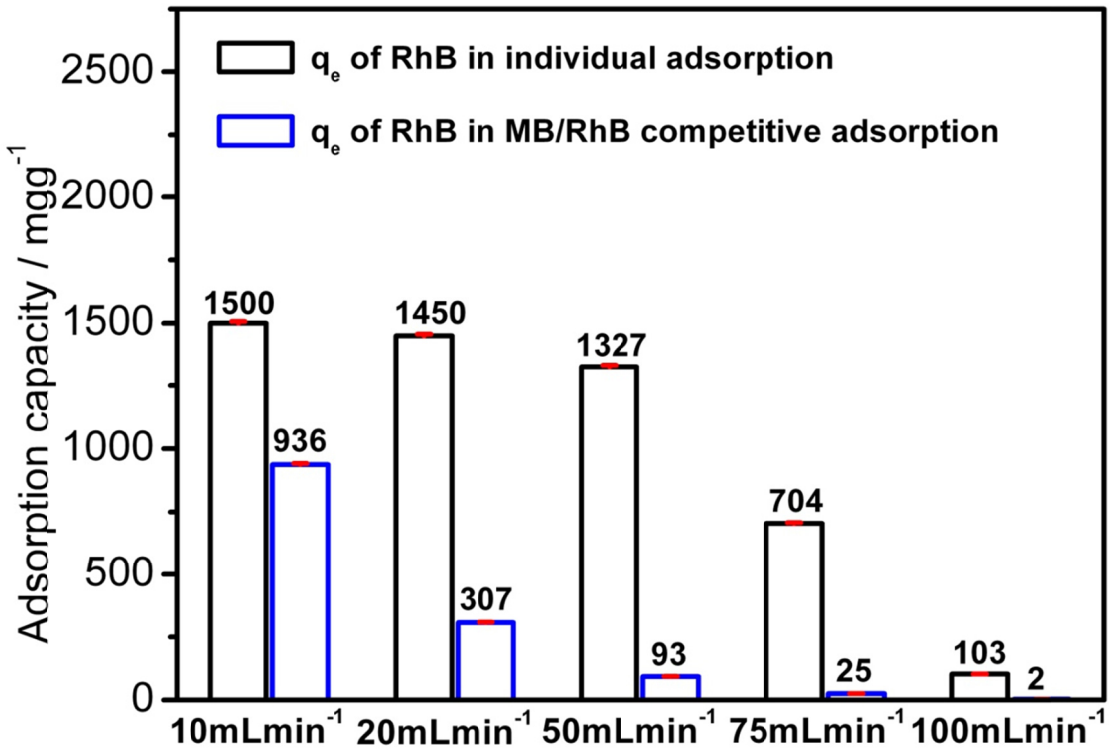


Fig.S30 Comparison of the RhB electrosorption capacities over B-N-O-H nanofoams in the individual and competitive adsorption in 600mgL^{-1} RhB at 1.2 V with different flow rates (the red mark represents error bars of capacity).

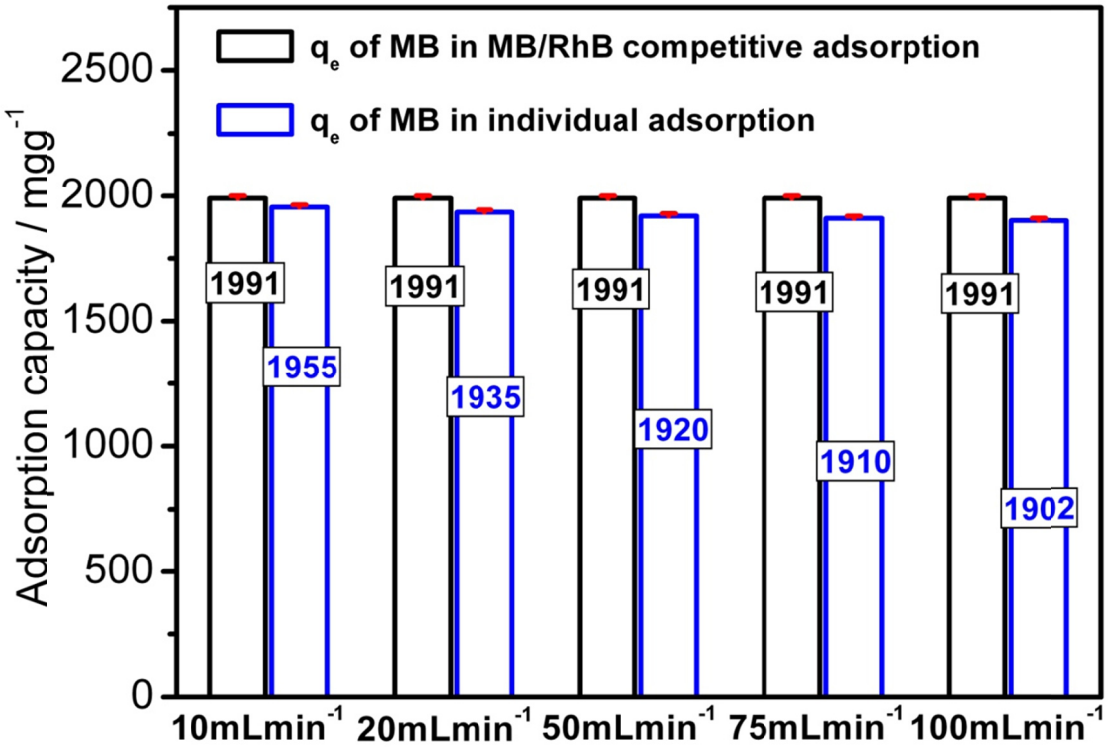


Fig.S31 Comparison of the MB electrosorption capacities over B-N-O-H nanofoams in the individual and competitive adsorption in 600mgL^{-1} RhB at 1.2 V with different flow rates (the red mark represents error bars of capacity).

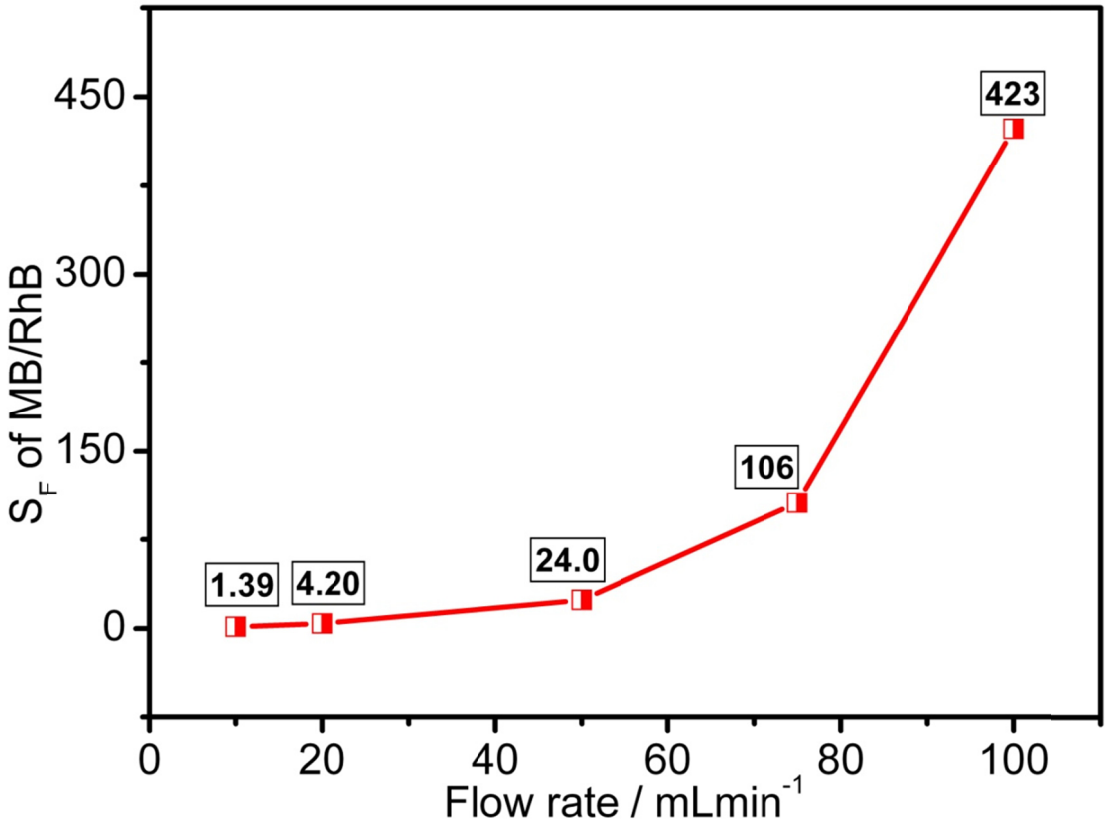


Fig.S32 The separation factors (S_F) of MB/RhB calculated from their competitive adsorption capacity over B-N-O-H nanofoams after being charged at 1.2 V with different flow rates.