Supporting Information

N, P co-doped microporous carbon as metal-free catalyst for selective oxidation of alcohols with air in water

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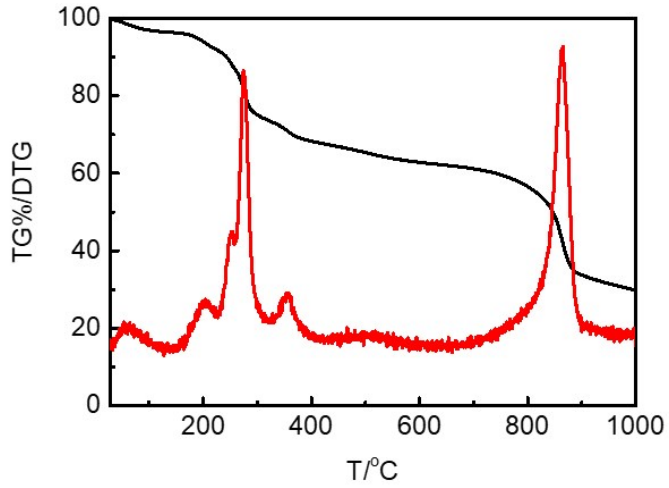

Figure S1. TG/DTA curves of pPDA-PA aerogel.

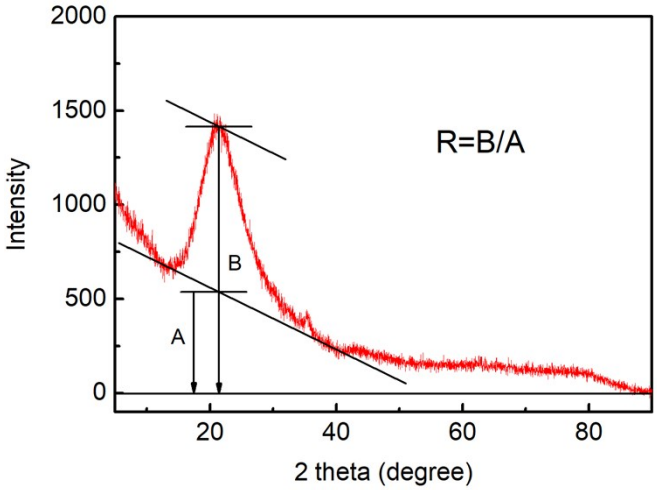

Figure S2. A sketch map for the calculation of the R values.

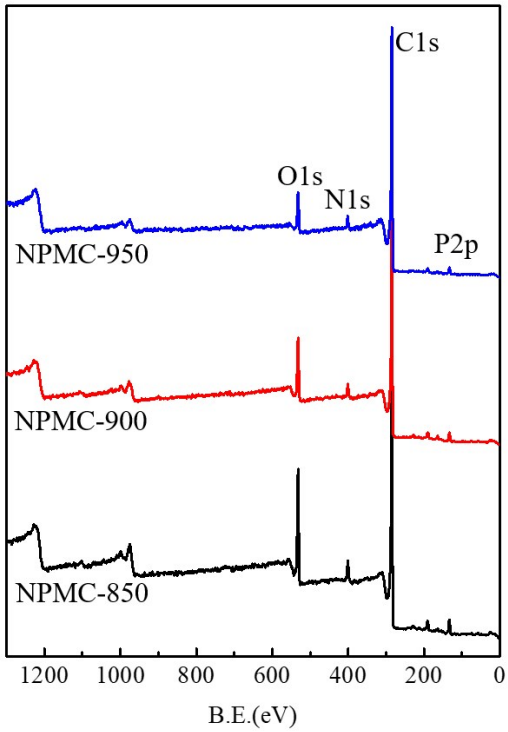

Figure S3. XPS survey spectra of the NPMCs.

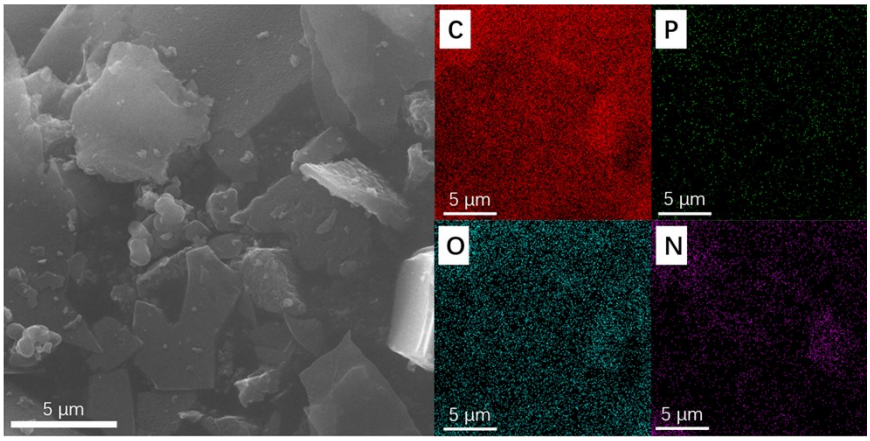

Figure S4. Energy-dispersive spectroscopy (EDS) elemental mapping images of NPMC-900.

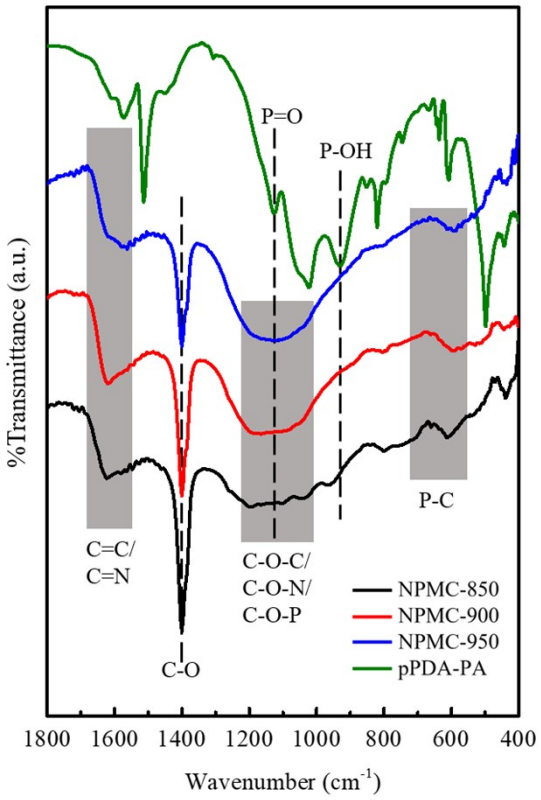

Figure S5. FT-IR spectra of NPMCs

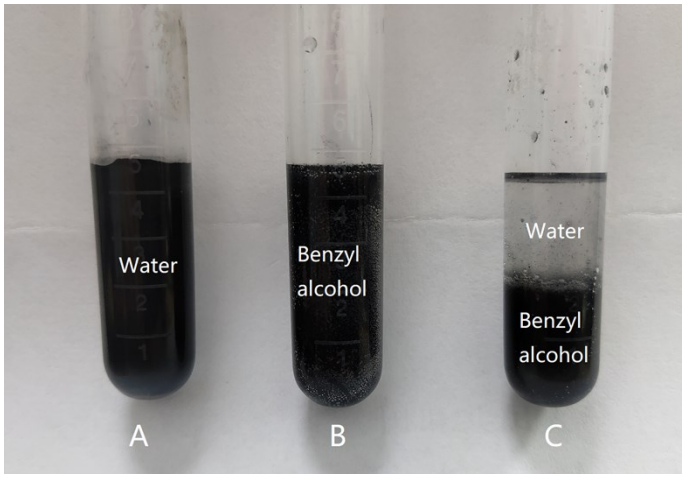

Figure S6. Photographs of NPMC-900 dispersed in water (A), Benzyl alcohol (B) and Water/Benzyl alcohol mixture (C).

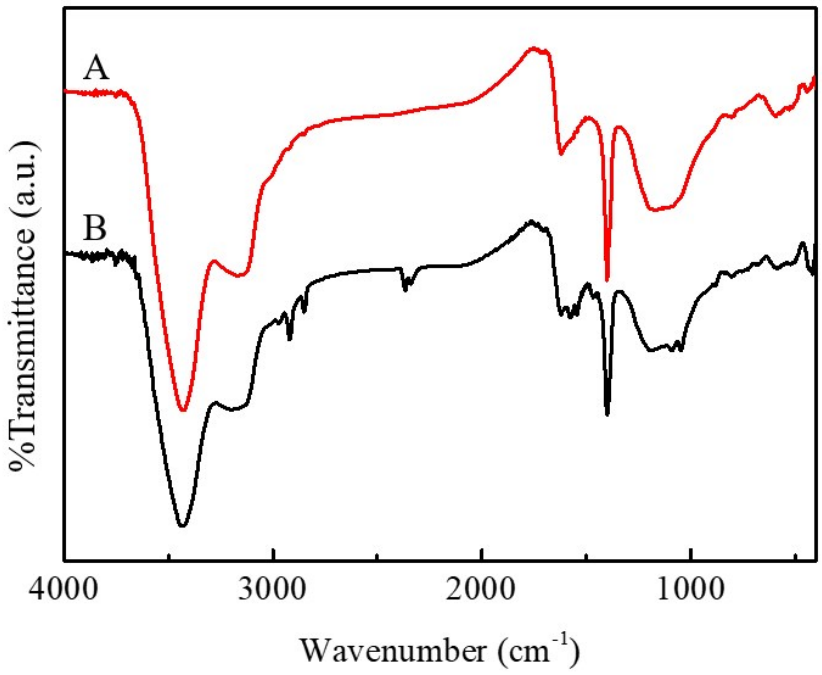

Figure S7. FT-IR spectra of NPMC-900 (A) and recovered NPMC-900 (B)

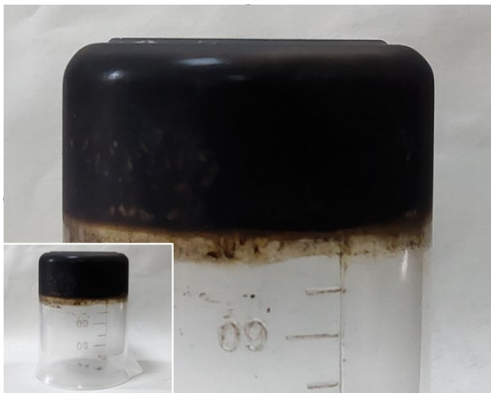

Figure S8. Photos of pPDA-PA hydrogel

Table S1. Carbon yields and porous structure of NPMCs

Catalyst	Yield/%	S_{BET}/ $m^2\ g^{-1}$	S_{micro}/ $m^2\ g^{-1}$	V_{tot}/ $m^3\ g^{-1}$	V_{micro}/ $m^3\ g^{-1}$
NPMC-850	24.07	621	581	0.351	0.292
NPMC-900	20.85	676	613	0.439	0.346
NPMC-950	18.19	731	674	0.443	0.351
NPC-900	22.36	227	214	0.134	0.113

Table S2. Raman spectra data of NPMCs

Catalyst	G/cm^{-1}	D/cm^{-1}	I_G/I_D
NPMC-850	1590	1354	1.01
NPMC-900	1594	1353	1.01
NPMC-950	1596	1354	1.00

Table S3. Calculated atomic % of C, P, N and O for NPMCs

Catalyst	P at%	C at%	N at%	O at%	Total
NPMC-850	3.09	76.08	5.27	15.56	100
NPMC-900	2.72	81.00	4.14	12.14	100
NPMC-950	2.04	86.86	3.63	7.47	100

Table S4. Calculated % of P-C and P-O present in NPMCs

Catalyst	Absolute %			Relative %		
	% P-C	% P-O	Total	% P-C	% P-O	Total
NPMC-850	1.05	2.04	3.09	34.05	65.95	100
NPMC-900	0.73	1.99	2.72	27.16	72.84	100
NPMC-950	0.64	1.40	2.04	31.31	68.69	100

Table S5. Calculated % of different type of oxygen present in NPMCs

Catalyst	Absolute %			Relative %		
	% C=O/ P=O	% C-O/ P-O-C/ P-O	Total	% C=O/ P=O	% C-O/ P-O-C/ P-O	Total
NPMC-850	4.01	11.56	15.57	25.75	74.25	100
NPMC-900	3.57	8.56	12.13	29.42	70.58	100
NPMC-950	2.54	4.93	7.47	34.03	65.97	100

Table S6. Calculated % of different type of nitrogen present in NPMCs

Catalyst	Absolute %				
	pyridinic N	pyrrolic N	graphitic N	oxidized N	Total
NPMC-850	1.04	1.54	2.28	0.41	5.27
NPMC-900	0.69	0.83	1.99	0.63	4.14
NPMC-950	0.37	0.56	2.18	0.52	3.63
	Relative %				
	pyridinic N	pyrrolic N	graphitic N	oxidized N	Total
NPMC-850	19.74	29.15	43.28	7.83	100
NPMC-900	16.61	20.01	48.04	15.34	100
NPMC-950	10.22	15.29	60.20	14.29	100

Table S7. Results of the selective oxidation of benzyl alcohols in water over different catalysts

Entry	Catalyst	Conv.[b]/%	Sel.[b]/%
1	NPMC- 800	85	>99
2	NPMC- 1000	50	>99

[a] Reaction conditions: benzyl alcohol (0.5 mmol), catalyst (50 mg), water (1 mL), 1-atm air initially filled in the pressure bottle, 120 ^{o}C, 5 h; [b] determined by GC.

Table S8. Performance of reported metal-free catalysts for selective oxidation of benzyl alcohol

Entry	**Ref.**	**Cat.**	**m(cat.)**	**Benzyl alcohol**	**solvent**	**T /^{o}C**	**T /h**	**oxidant**	**Conv. %**	**Sel. %**
1	This work	NPMC-900	50mg	0.5mmol	water	120	5	air	99	>99
2	[8]	PGc	50mg	100mg	water	100	24	O_2	90	96
3	[15]	H_2SO_4	1mmol	1mmol	DMSO	150	1	H_2SO_4	99	94
4	[16]	AC	100mg	1.1mmol	ethanol	120	5	air	23	>99
5	[18]	NG-900	30mg	0.1mmol	water	70	10	O_2	13	>99
6	[19]	GO	100mg	50 mg	-	150	24	air	99	85
7	[42]	NSC	10mg	1mmol	1,4-dioxane	90	5	HNO_3	96	92
8	[43]	PS-Gc	50mg	0.1 mL	water	80	48	O_2	54	88
9	[44]	Au/NPC	20mg	0.5mmol	Toluene	25	1	O_2	99	>99
10	[45]	Pd_{NPs}@PANI/HNS	20mg	1mmol	Toluene	80	5	O_2	95	95

Table S9. Porous structure of NPMC-900 and recovered NPMC-900

Catalyst	S_{BET}	$S_{micro}/m^2\ g^{-1}$	$V_{tot}/m^3\ g^{-1}$	$V_{micro}/m^3\ g^{-1}$
NPMC-900	676	613	0.439	0.346
Reused NPMC-900	681	614	0.445	0.348