Electronic Supplementary Information (ESI†)

Nitrogen and phosphorus co-doped cubic ordered mesoporous carbon as supercapacitor electrode material with extraordinary cyclic stability

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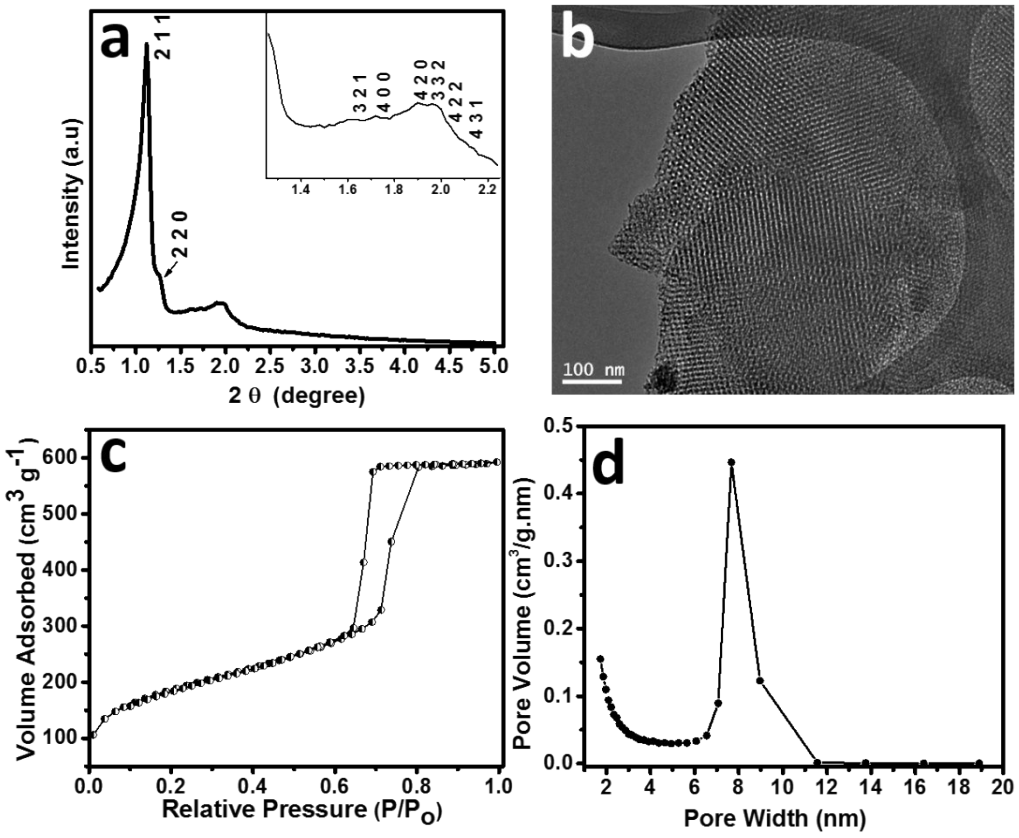

Fig. S1 (a) Small angle XRD profiles, (b) HR-TEM image, (c) N_2-sorption isotherms, and (d) pore size distribution curve for KIT-6 silica template.

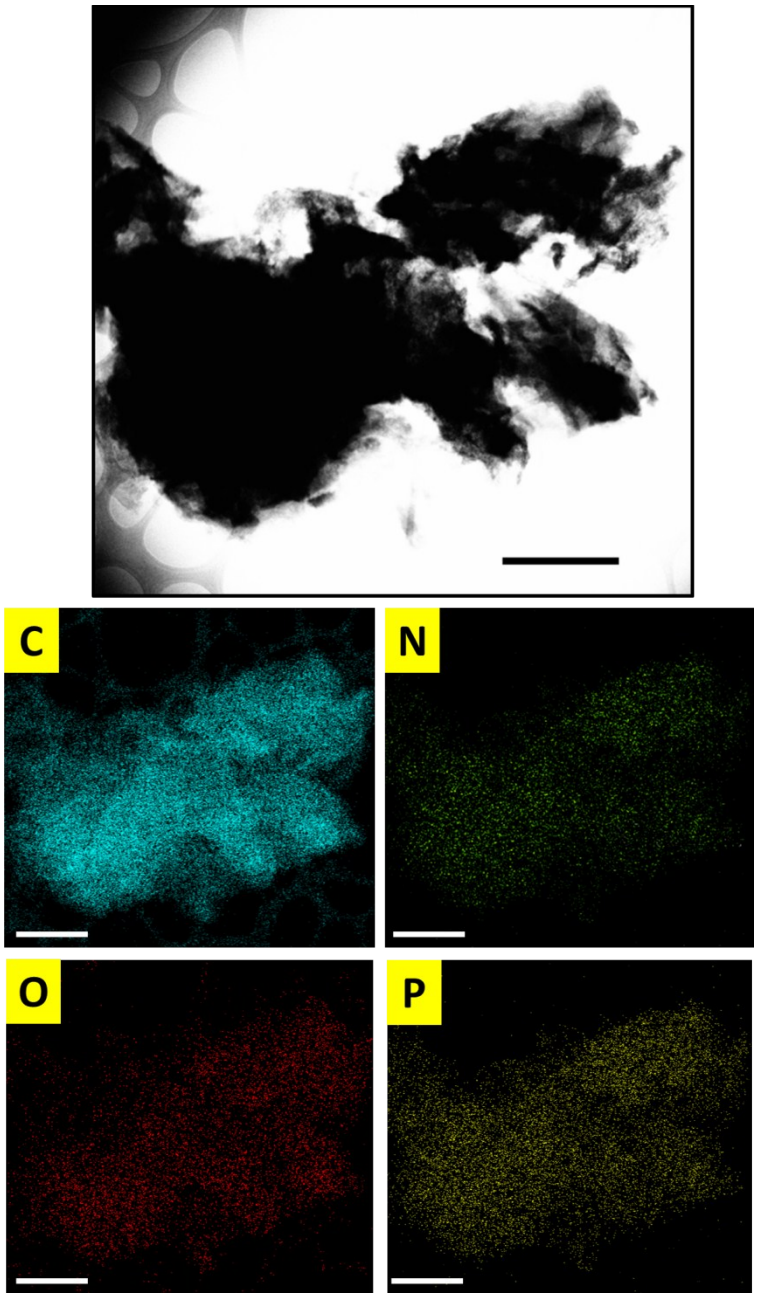

Fig. S2 TEM images of NP-OMC with EDS elemental mapping for C, N, O, and P elements. (Scale bar: 1 μm)

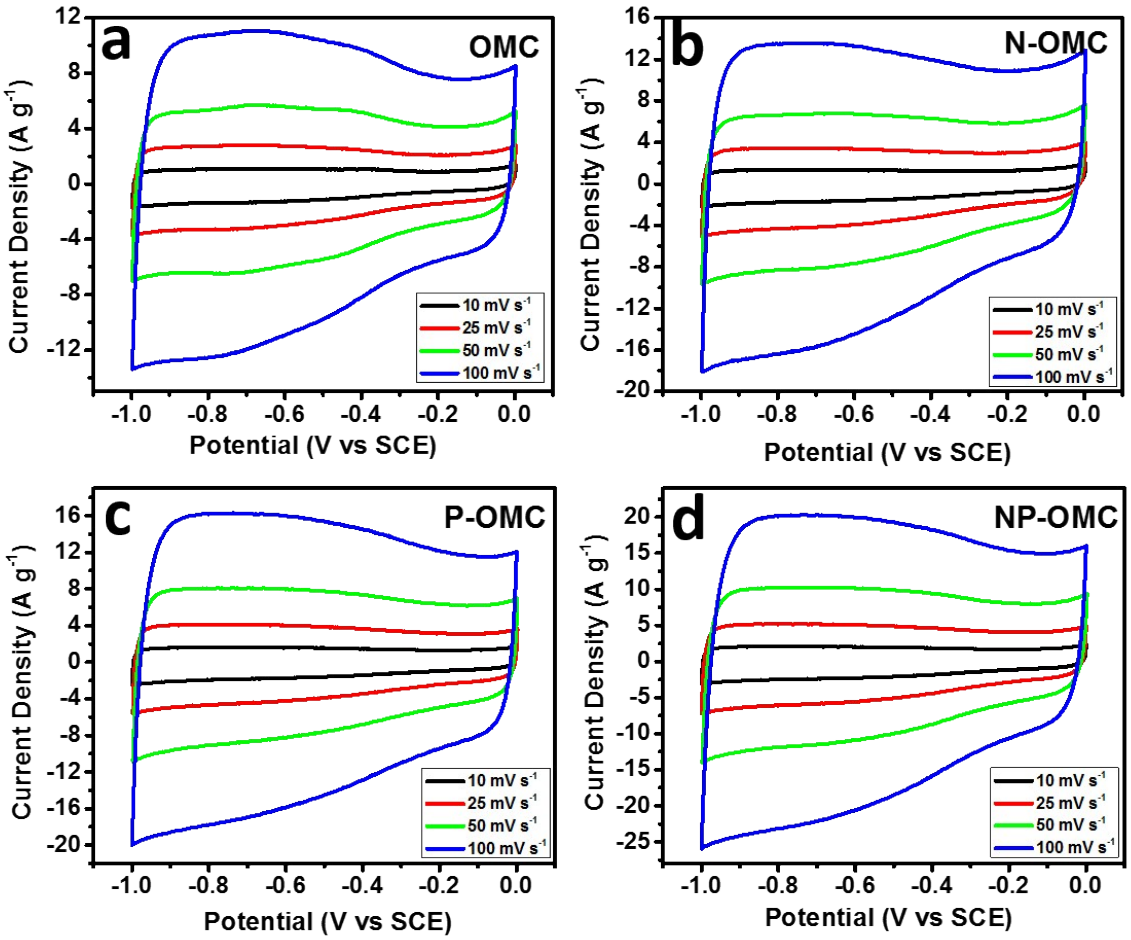

Fig. S3 Cyclic voltammograms at different potential scan rates of 10, 25, 50, and 100 mV s^{-1} for (a) un-doped OMC, (b) N-OMC, (c) P-OMC, and (d) NP-OMC.

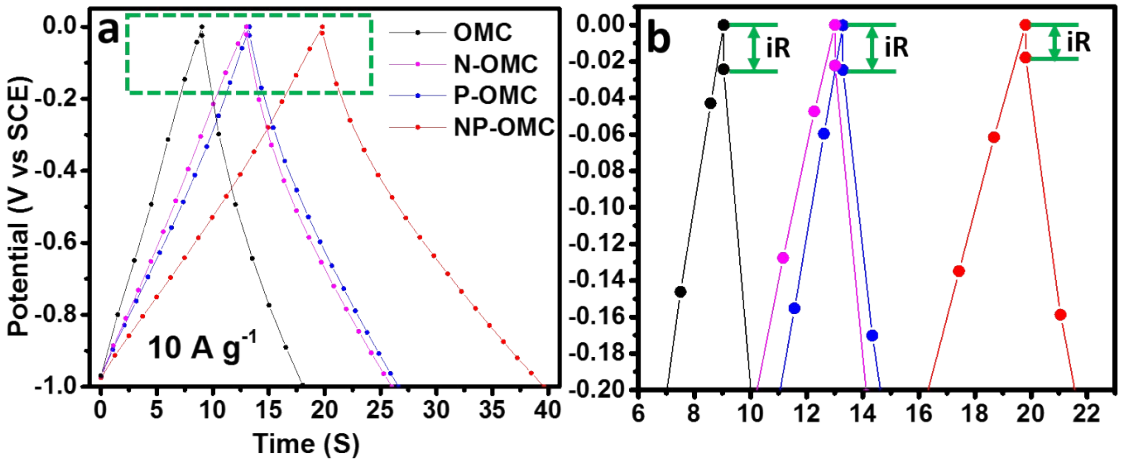

Fig. S4 (a) Comparative charge-discharge curves at 10 A g^{-1} current density for all the OMC electrodes with (b) magnified parts showing the iR drops.

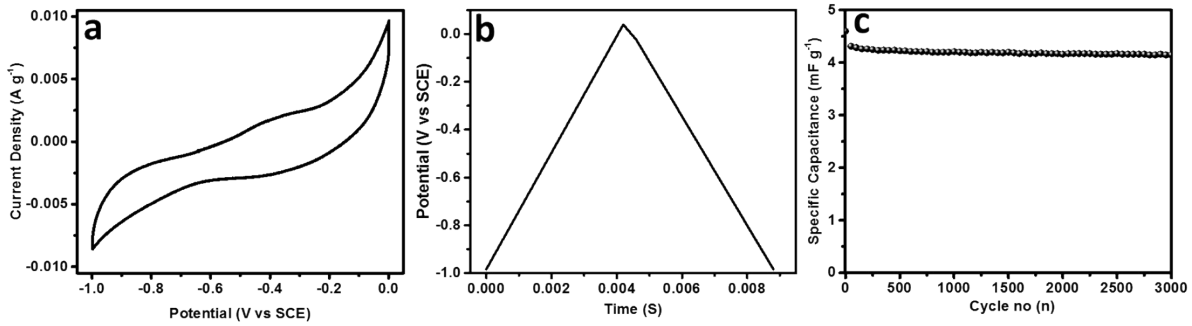

Fig. S5 Electrochemical analysis of bare Ni foam in 6.0 M KOH electrolyte by (a) cyclic voltammogram at 100 mV s^{-1} potential scan rate, (b) charge-discharge at 1 A g^{-1} current density, and (C) cycling stability at 1 A g^{-1} current density.

In this work, nickel foam was employed as an electrode support (current collector) for testing supercapacitor in aqueous alkaline electrolyte in the potential range of 0.0 to -1.0 V (vs SCE). In this range, Ni foam is inert to any electrochemical reaction. Therefore, only the capacitive behaviour of active electrode material will be shown in this potential range. Electrochemical analysis results of bare Ni foam in 6.0 M KOH electrolyte are shown in Fig. S5. The specific capacitance obtained from both cyclic voltammetry (Fig. S5a) and charge-discharge measurements (Fig. S5b) was around 5 mF g^{-1}, which is negligible compared to that of OMC electrodes. Moreover, no prominent faradaic redox peak is observed, which indicates that Ni foam is highly stable as a current collector in aqueous alkaline electrolyte. The cyclic stability data (Fig. S5c) also show that the Ni foam is stable up to 3000 charge-discharge cycles.

Table S1 Cumulative data of all the parameters for different OMC samples

Sample name	Amount of KIT-6 silica template (g)	Amount of precursor (g)			BET surface area ($m^2 g^{-1}$)	Atomic content from XPS analysis (%)				Specific capacitance at 1 A g^{-1} ($F g^{-1}$)
		Saccarose	Urea	Phytic acid		C	N	P	O	
OMC	2.0	2.0	0	0	1127	96.5	-	-	3.5	107
N-OMC	2.0	1.7	0.3	0	1275	91.1	4.4	-	4.5	148
P-OMC	2.0	1.7	0	0.3	2282	89.5	-	2.8	7.7	162
NP-OMC	2.0	1.6	0.2	0.2	1968	88.2	3.2	1.7	6.9	210