Electronic Supplementary material (ESI) for Journal of Materials Chemistry A
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# Electronic Supplementary Information (ESI)

## Mesoporous $NaTi_2(PO_4)_3$/CMK-3 Nanohybrid as Promising Anode for Long-life Na-ion Batteries

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**Synthesis of the mesoporous CMK-3**

Following the method reported by Zhao *et al.*,[1] SBA-15 templates were synthesized using Pluronic P123 ($EO_{20}PO_{70}EO_{20}$, $M_w$ ~5800) as surfactant and tetraethylorthosilicate (TEOS) as silica source. A nanocasting method was used to prepare the CMK-3 from SBA-15 template. Typically, 1.25 g of sucrose was dissolved in a solution containing 11 mL of deionization (DI) water and 7.2 mL of 0.2 M $H_2SO_4$. 1.0 g of the prepared SBA-15 was then dispersed in the above solution and the mixture was ultrasonicated for 1 h. The mixture was then heated at 100 °C for 6 h and subsequently at 160 °C for another 6 h. The impregnation and baking process was repeated once with another aqueous solution containing 11 mL of DI water, 0.75 g of sucrose and 7.2 mL of 0.2 M $H_2SO_4$. The composite was completely carbonized at 900 °C for 5 h in an inert nitrogen atmosphere. To remove the SBA-15 silica template, the composite was stirred in 2 M hot NaOH solution twice. After that, the obtained CMK-3 carbon templates were functionalized by 6 M $HNO_3$.

1 D. Y. Zhao, J. L. Feng, Q. S. Huo, N. Melosh, G. H. Fredrickson, B. F. Chmelka and G. D. Stucky, Science, 1998, **279**, 548.

**Table S1** Atomic coordinates, isotropic thermal parameters and occupation numbers for the NTP phase refined from X-ray powder diffraction data. NASICON-type structure in space group R-3c (No. 167); cell parameters: $a$ = 8.4884 (5) Å, $c$ = 21.8123 (3) Å, $V$ = 1361.07 (2) Å$^3$ and $Z$ = 6; $R_{wp}$ = 10.32 %, $R_p$ = 7.03 %, $R_I$ = 4.47 %, $S$ = 2.97.

| Atom | Site | g | x | y | Z | B (Å$^2$) |
|---|---|---|---|---|---|---|
| Na | 6b | 1.0 | 0.0 | 0.0 | 0.0 | 2.8(2) |
| Ti | 12c | 1.0 | 0.0 | 0.0 | 0.1447(1) | 0.5(1) |
| P | 18e | 1.0 | 0.2868(3) | 0.0 | 1/4 | 0.6(1) |
| O1 | 36f | 1.0 | 0.1751(6) | 0.9781(6) | 0.1934(2) | 0.7(1) |
| O2 | 36f | 1.0 | 0.1941(4) | 0.1635(4) | 0.0903(2) | 0.6(1) |

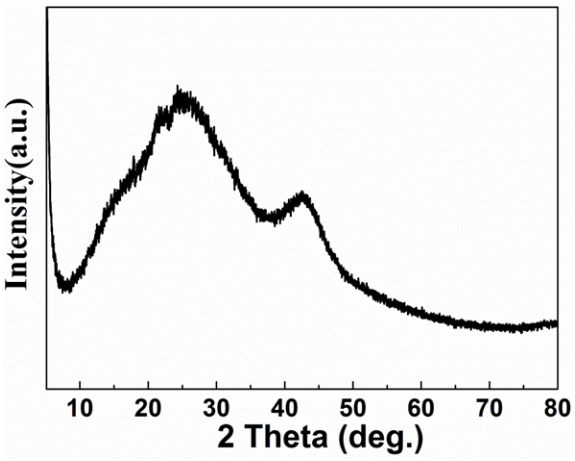


**Fig. S1** Wide angle X-ray diffraction pattern of the CMK-3.

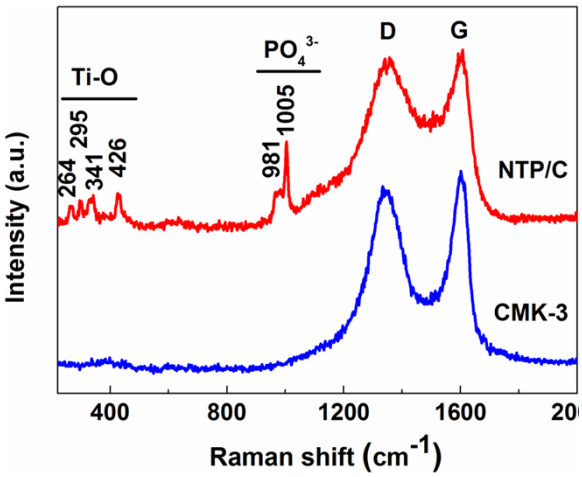


**Fig. S2** Raman spectrums of mesoporous NTP/C nanohybrid and CMK-3, showing the Raman band of Ti-O, $PO_4^{3-}$ and C.

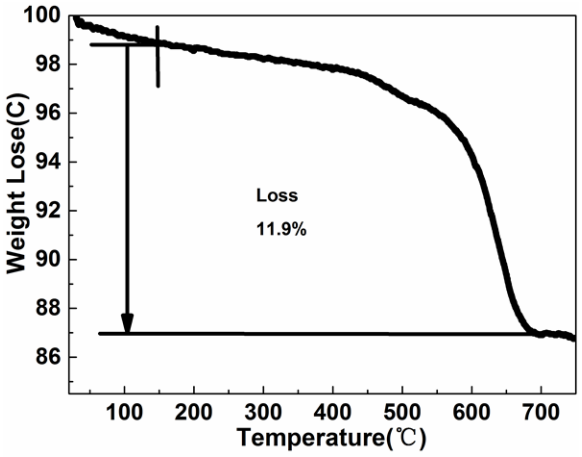


**Fig. S3** TG curve of the mesoporous NTP/C sample in air atmosphere.

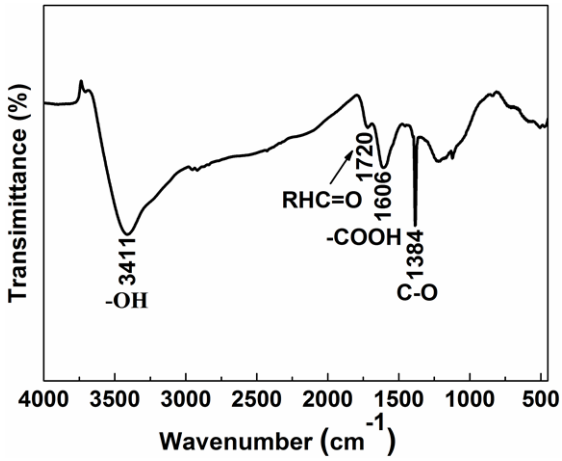


**Fig. S4** FT-IR spectrum of the acid-treated CMK-3 recorded in the range of 450-4000 $cm^{-1}$.

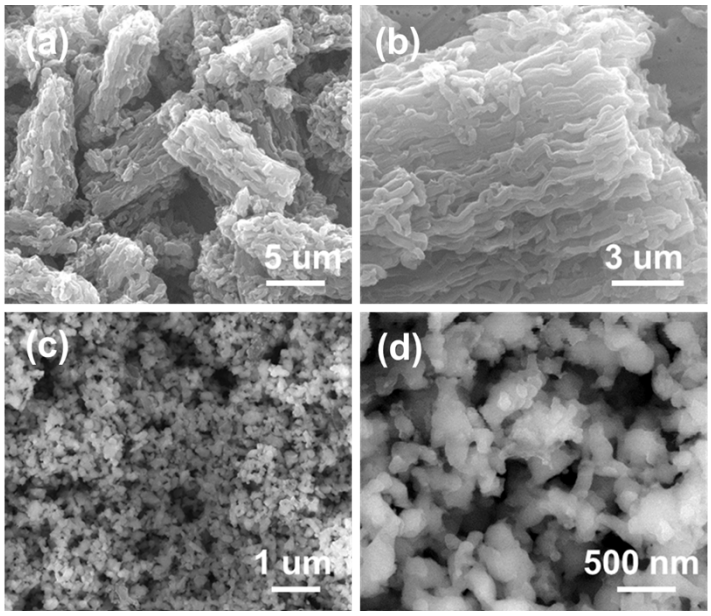


**Fig. S5** FESEM images of the CMK-3 (a, b) and mesoporous NTP/C nanohybrid (c, d).

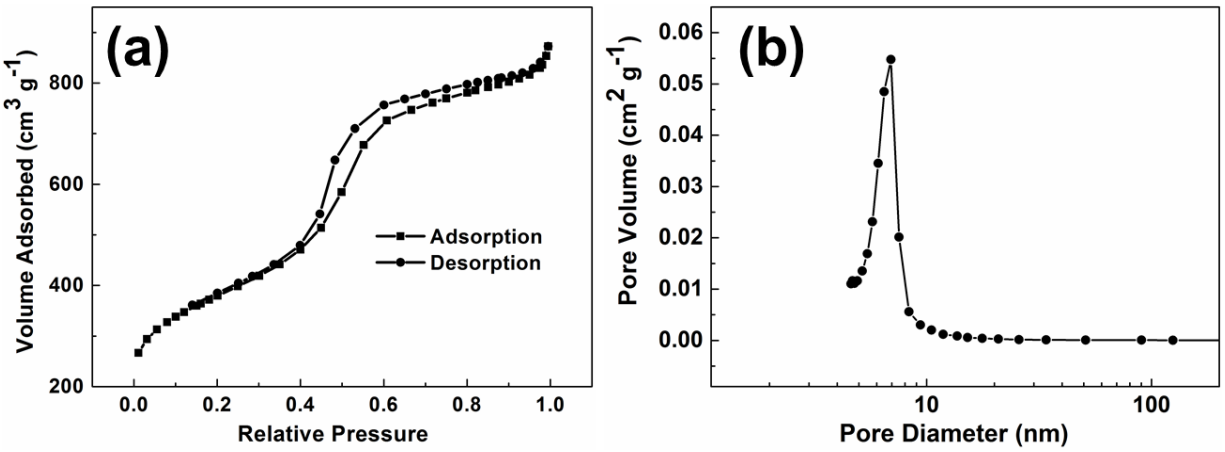


**Fig. S6** Nitrogen sorption isotherms (a) and PSD data (b) of the mesoporus CMK-3.

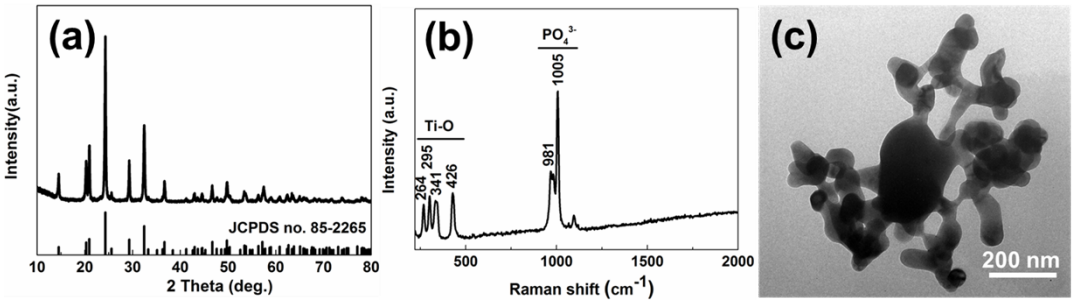


**Fig. S7** XRD pattern (a), Raman spectrum (b) and TEM image (c) of pure NTP. The black vertical lines in (a) for the standard spectrm of JCPDS no. 85-2265.