Rational design of Ni/Ni_2P heterostructures encapsulated in 3D porous carbon networks for improved lithium storage

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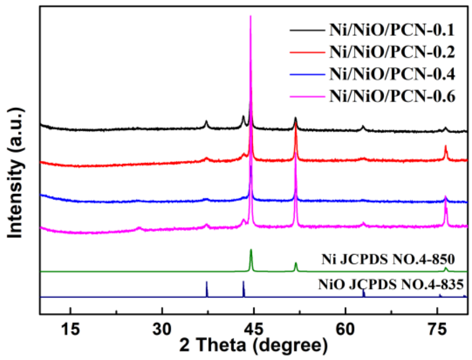

Fig. S1 XRD patterns of the as-prepared Ni/NiO/PCN precursors.

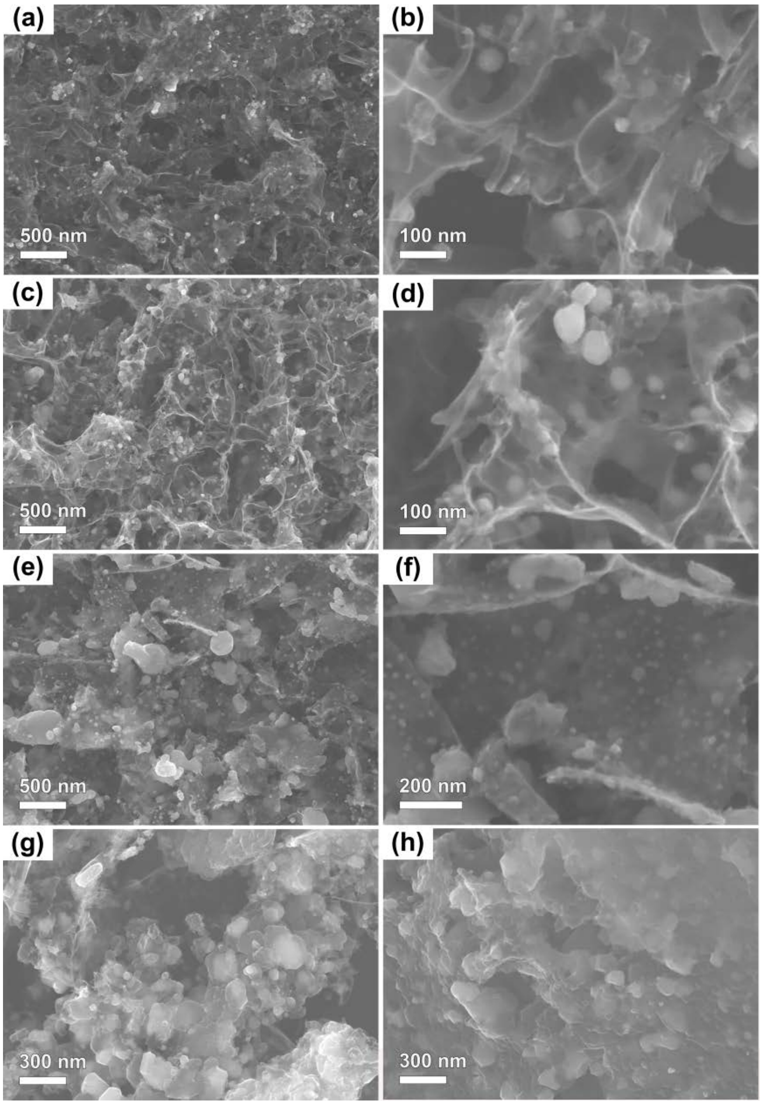

Fig. S2 SEM images of the (a, b) Ni/NiO/PCN-0.1 precursor, (c, d) Ni/NiO/PCN-0.2 precursor, (e, f) Ni/NiO/PCN-0.4 precursor and (g, h) Ni/NiO/PCN-0.6 precursor.

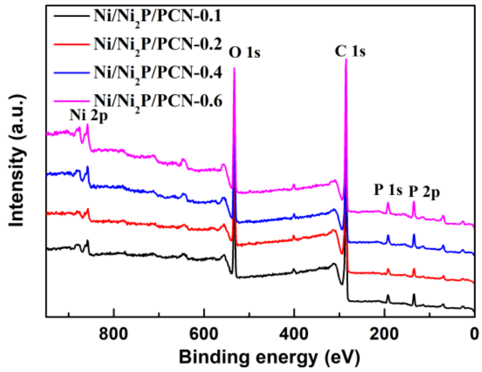

Fig. S3 XPS spectrum of the as-prepared $Ni/Ni_2P/PCN$ composites.

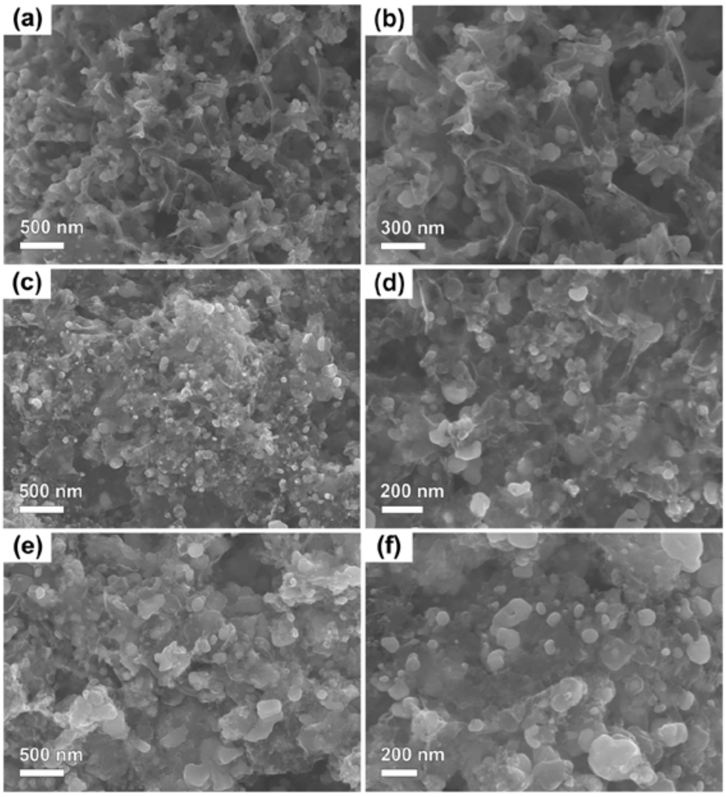

Fig. S4 SEM images of the (a, b) $Ni/Ni_2P/PCN$-0.1, (c, d) $Ni/Ni_2P/PCN$-0.4 and (e, f) $Ni/Ni_2P/PCN$-0.6 composites.

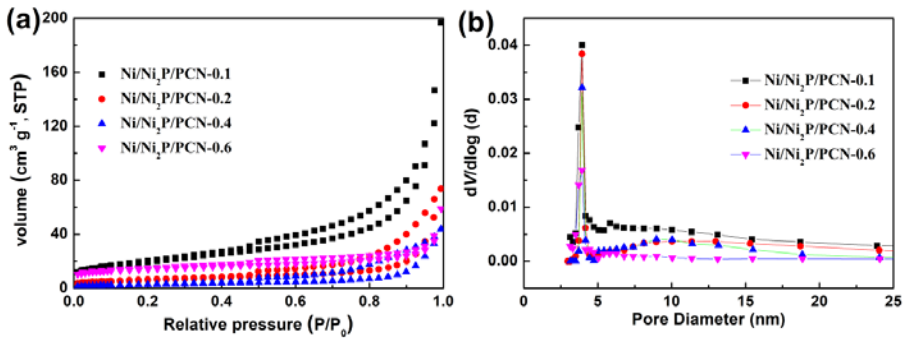

Fig. S5 (a) Nitrogen adsorption-desorption isotherms and (b) Pore size distribution of $Ni/Ni_2P/PCN$ composites.

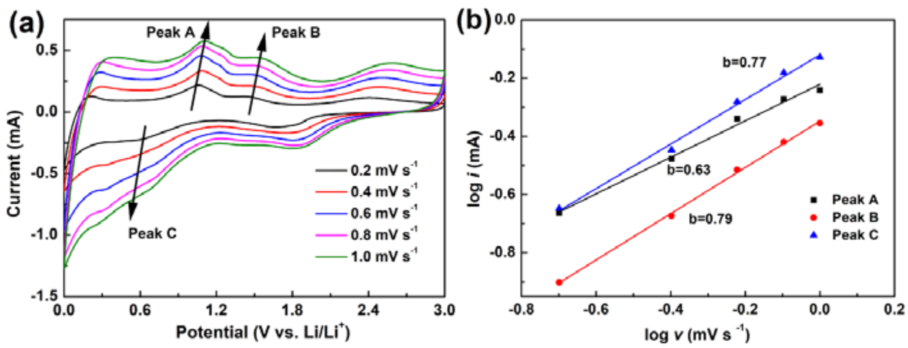

Fig. S6 (a) CV curves of $Ni/Ni_2P/PCN$-0.2 electrode for Li-ion storage with increasing sweep rates from 0.2 to 1.0 mV s^{-1}, (b) Calculation of the *b* values.

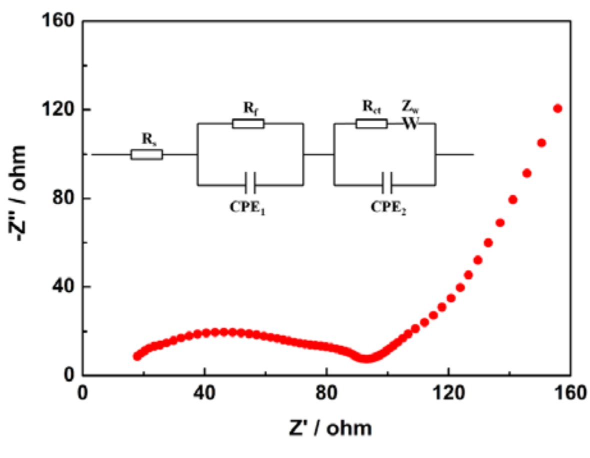

Fig. S7 Nyquist plots of the $Ni/Ni_2P/PCN$-0.2 electrode after 300 cycles and the relevant equivalent circuit.

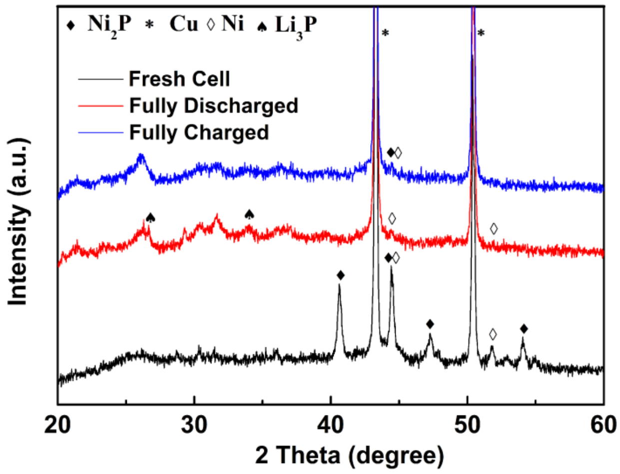

Fig. S8 XRD patterns of the Ni/Ni_2P/PCN-0.2 electrodes after 300cycles.

Table S1 The contents of each component in the Ni/Ni_2P/PCN composites according to the XPS results.

Material	**Ni_2P (wt%)**	**Ni (wt%)**	**C (wt%)**
Ni/Ni_2P/PCN-0.1	24.9	0.8	74.3
Ni/Ni_2P/PCN-0.2	32.3	2.5	65.2
Ni/Ni_2P/PCN-0.4	35.9	2.6	61.5
Ni/Ni_2P/PCN-0.6	42.7	2.8	54.5

Table S2 Simulated impendence parameters (R_s, R_{ct}) of the Ni/Ni_2P/PCN samples before cycling.

Material	**R_s (Ω)**	**R_{ct} (Ω)**
Ni/Ni_2P/PCN-0.1	9.6	169.3
Ni/Ni_2P/PCN-0.2	6.3	127.6
Ni/Ni_2P/PCN-0.4	5.0	98.6
Ni/Ni_2P/PCN-0.6	5.7	83.3