Breakage of dense structure of coal precursor increases plateau capacity of hard carbon for sodium storage

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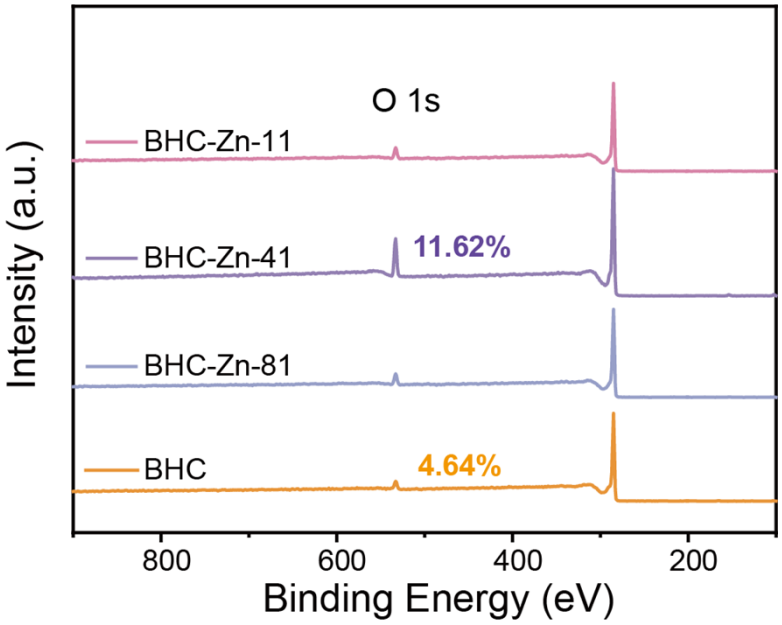

Fig. S1 XPS survey spectra of BHC and BHC-Zn.

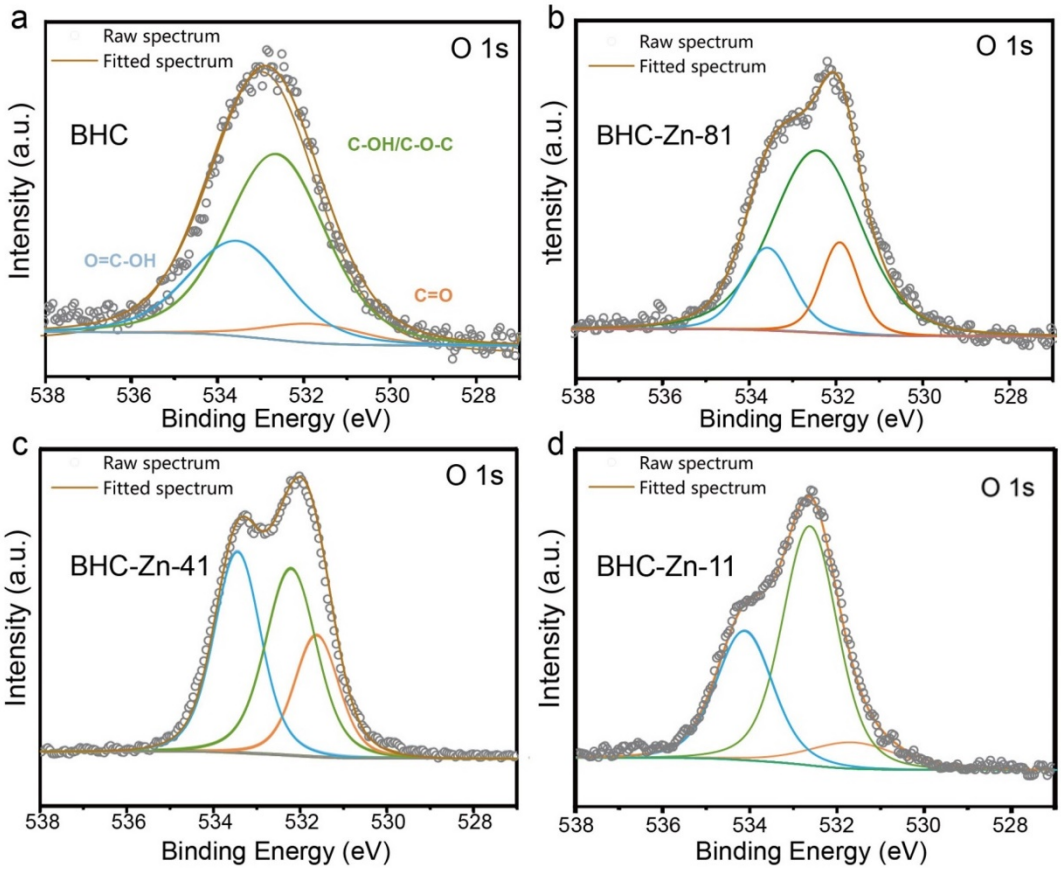

Fig. S2 High-resolution O 1s spectra of BHC and BHC-Zn.

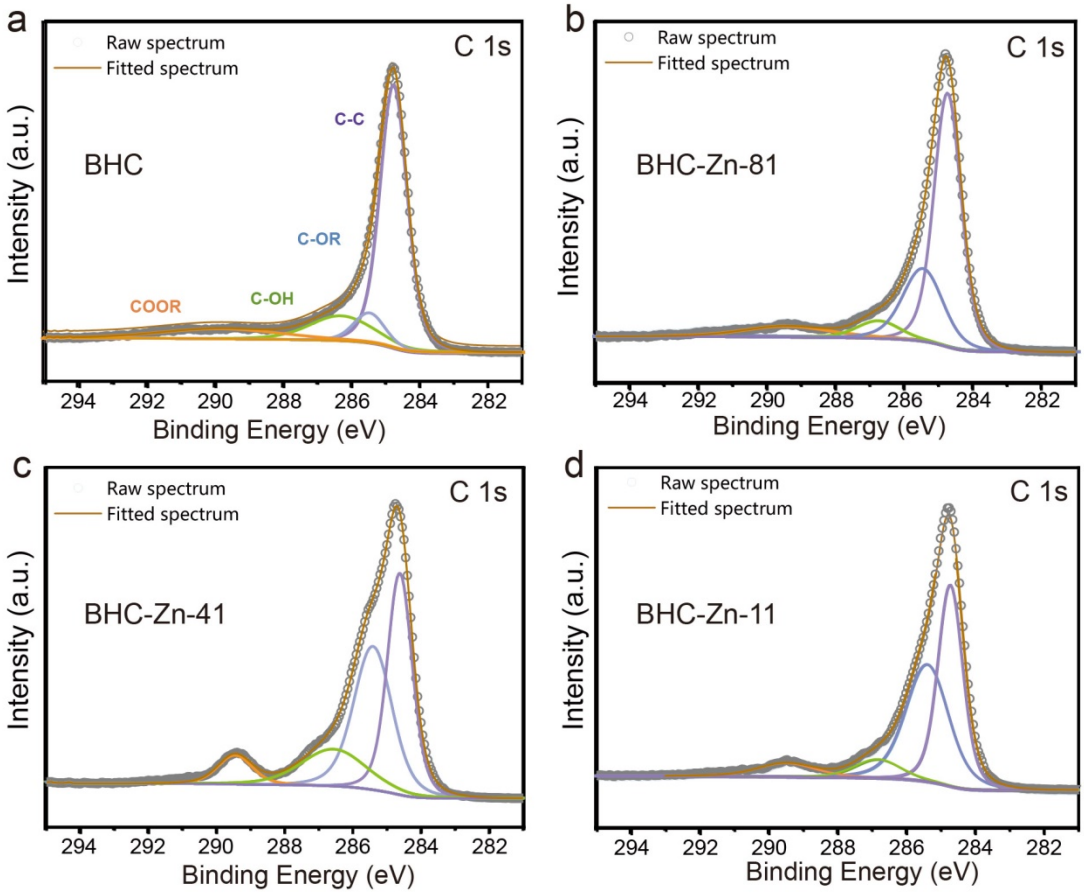

Fig. S3 High-resolution C 1s spectra of BHC and BHC-Zn.

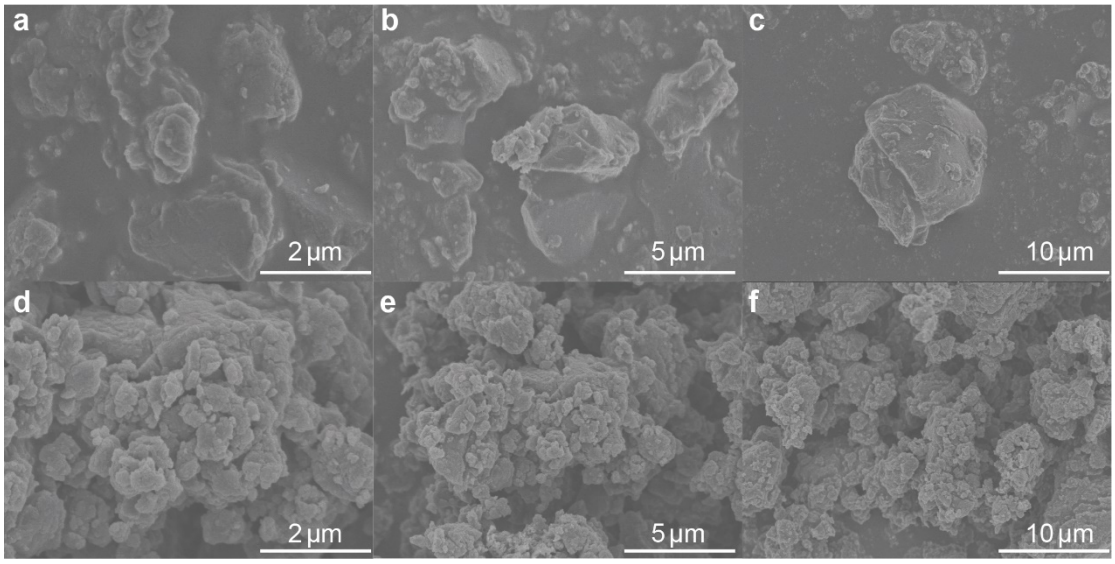

Fig. S4 SEM of (a, b, c)BHC and (d, e, f)BHC-Zn-41.

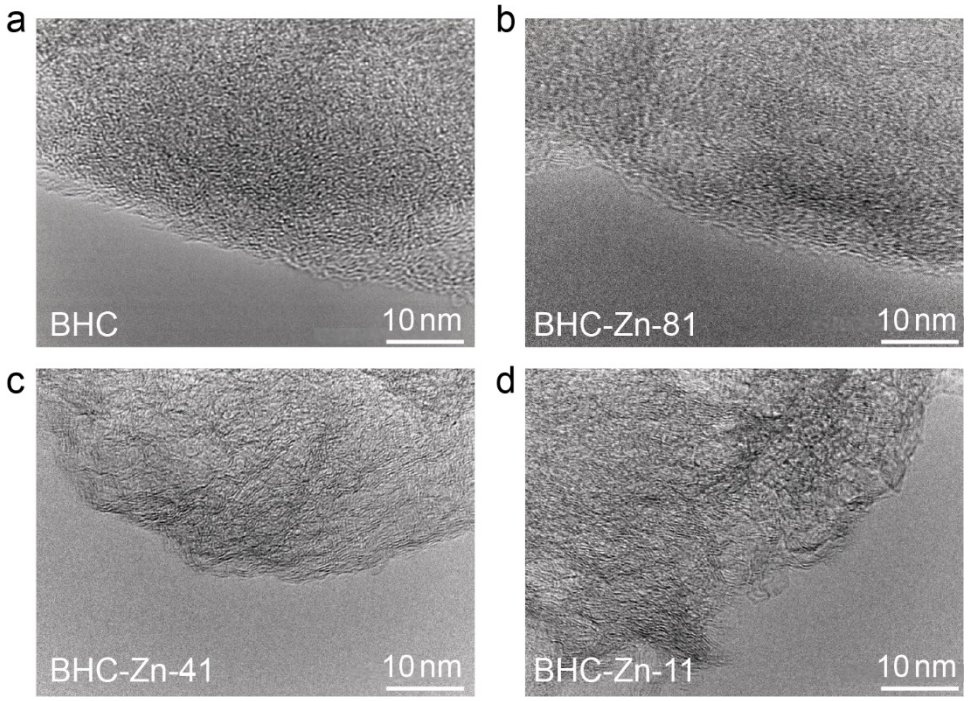

Fig. S5 HRTEM of (a)BHC, (b)BHC-Zn-11, (c)BHC-Zn-41 and (d)BHC-Zn-81.

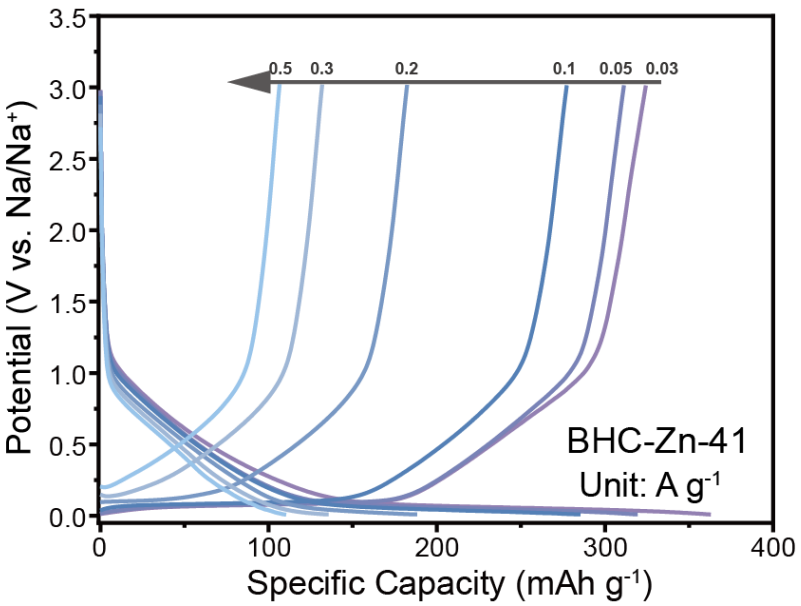

Fig. S6 The charge discharge curves of sample BHC-Zn-41 at different current densities.

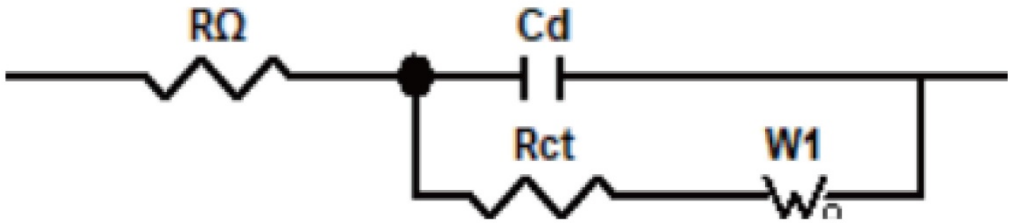

Fig. S7 equivalent circuit fitting diagram

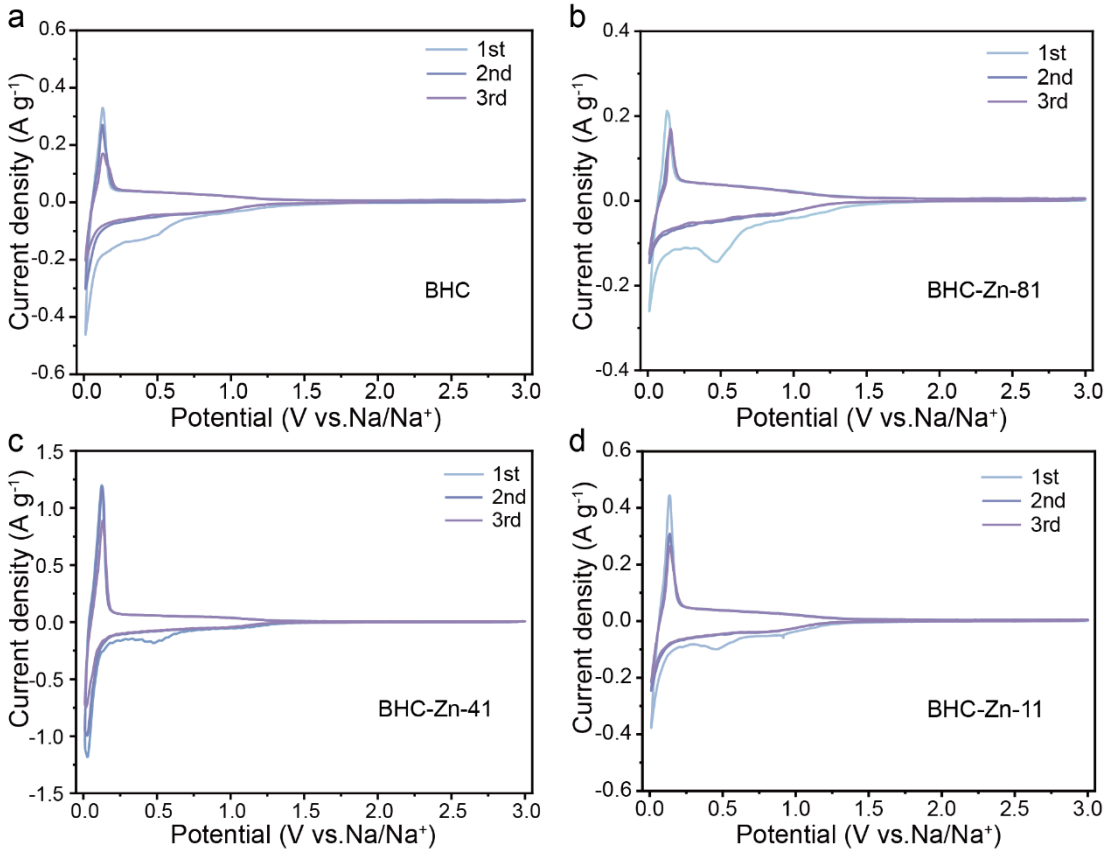

Fig. S8 the CV curves of (a)BHC, (b)BHC-Zn-11, (c)BHC-Zn-41 and (d)BHC-Zn-81 at 0.1 mV s^{-1}

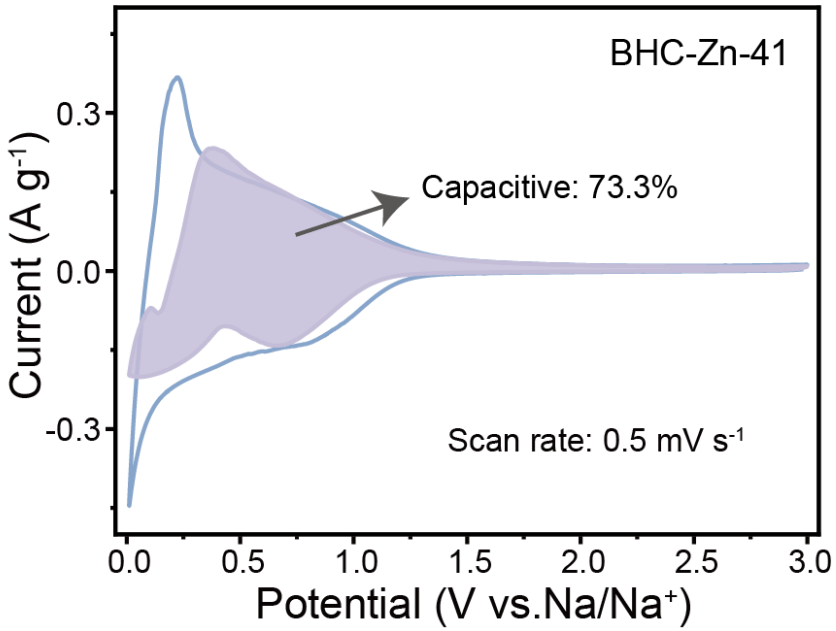

Fig. S9 CV curve of BHC-Zn-41 at the scan rate of 0.5mV s^{-1}. Shaded region exhibits the capacitive contribution.

Table S1 A literature comparison with capacity for coal derived carbon

Sample	Capacity ($mAh\ g^{-1}$)	Current Density	Reference
Coal-based hard carbon with NH_3 treatment	220	0.1 A g^{-1}	[1]
Porous flaky HC derived from coal	303.6	50 mA g^{-1}	[2]
Coal based hard carbon with fast carbonization	292	0.1 C	[3]
Bituminous coal derived carbon	287.1	20 mA g^{-1}	[4]
Coal derived hard carbon	306.3	30 mA g^{-1}	[5]
BHC-Zn-41	325.3	30 mA g^{-1}	This work

Table S2 Equivalent circuit fitting results of BHC and BHC-Zn.

Samples	R_{Ω} (+)	R_{ct} (+)
BHC-Zn-11	4.09	108.31
BHC-Zn-41	4.23	12.07
BHC-Zn-81	3.82	118.12
BHC	6.87	44.25

Reference

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