Energy Materials

Supplementary Materials

Synergistic enhancement of lithium storage in biomass-derived hard carbon anodes via structure and phosphorus doping engineering

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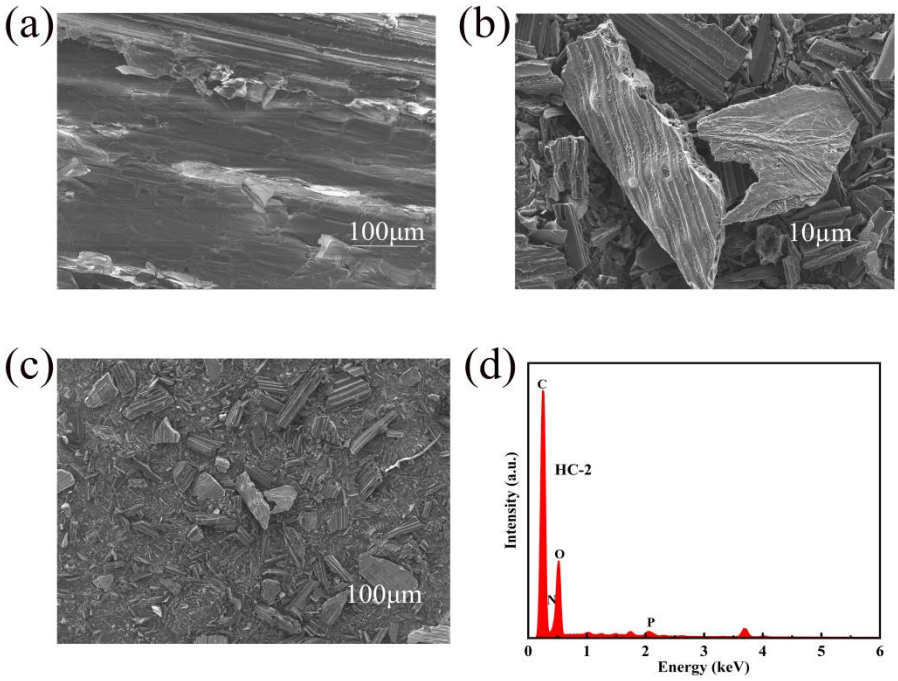

Fig. S1 (a) SEM image of OHC-2, (b-c) SEM images of HC-2 at different magnifications and (d) EDS image of HC-2.

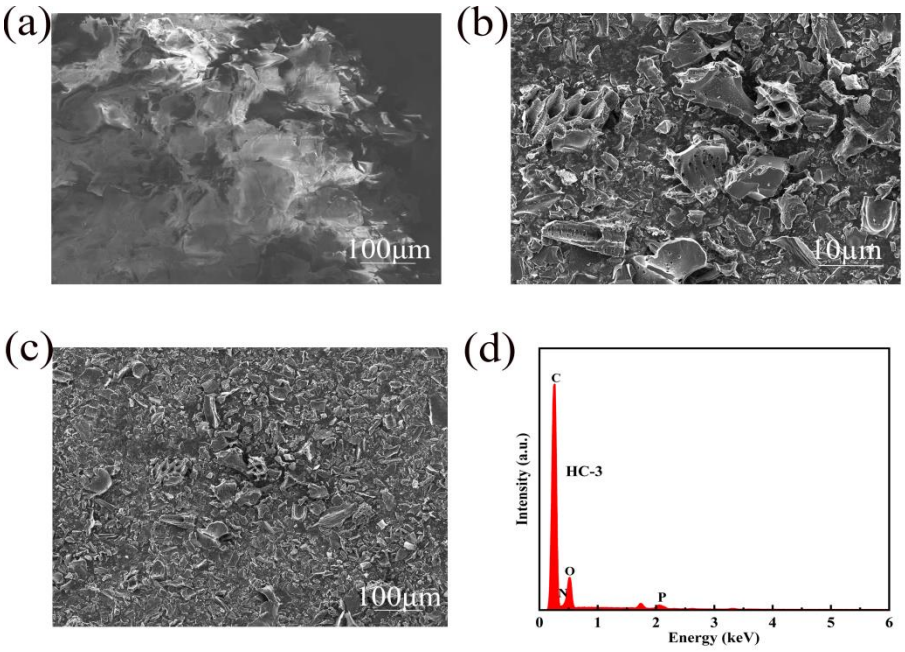

Fig. S2 (a) SEM image of OHC-3, (b-c) SEM images of HC-3 at different magnifications and (d) EDS image of HC-3.

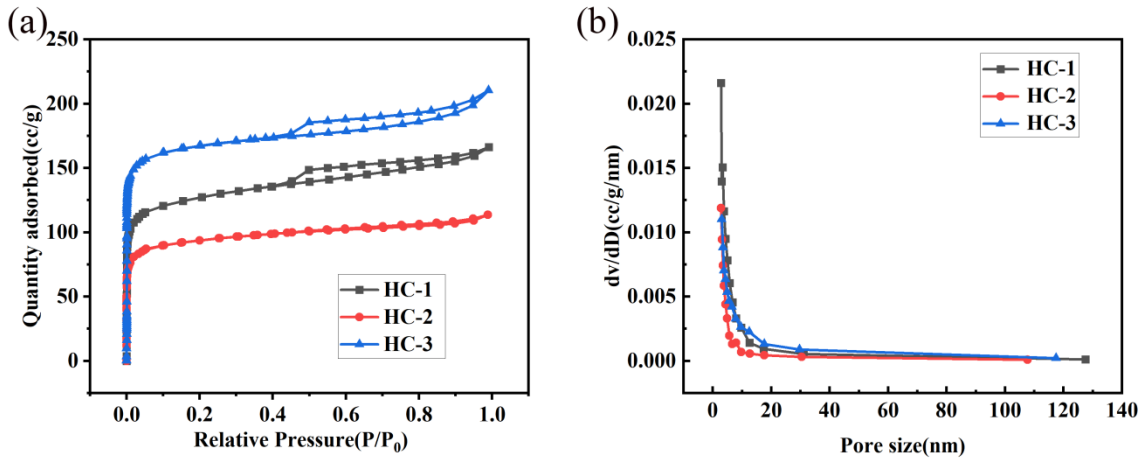

Fig. S3 (a) N_2 adsorption/desorption isothermal curves and (b) Pore size distribution function of these three hard carbon anode materials.

Table S1. Structural characteristic of hard carbon materials prepared by different precursor

Sample	BET surface area (m^2/g)	Total pore volume (cm^3/g)	The average pore diameter(nm)
HC-1	474.00	0.086	2.78
HC-2	367.05	0.064	2.70
HC-3	656.91	0.114	4.21
HC-1-P5	491.70	0.110	1.89
HC-1-P10	632.55	0.115	1.95
HC-1-P15	786.30	0.212	2.11

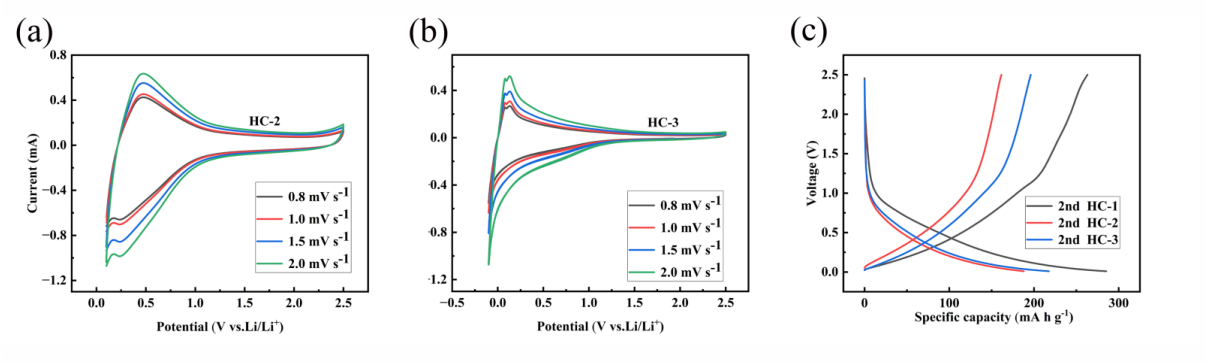

Fig. S4 (a-b) CV curves of HC-2 and HC-3 at different rates; **(c)** the second cycle galvanostatic charge/discharge curves of the three materials at 0.1 mA g^{-1}.

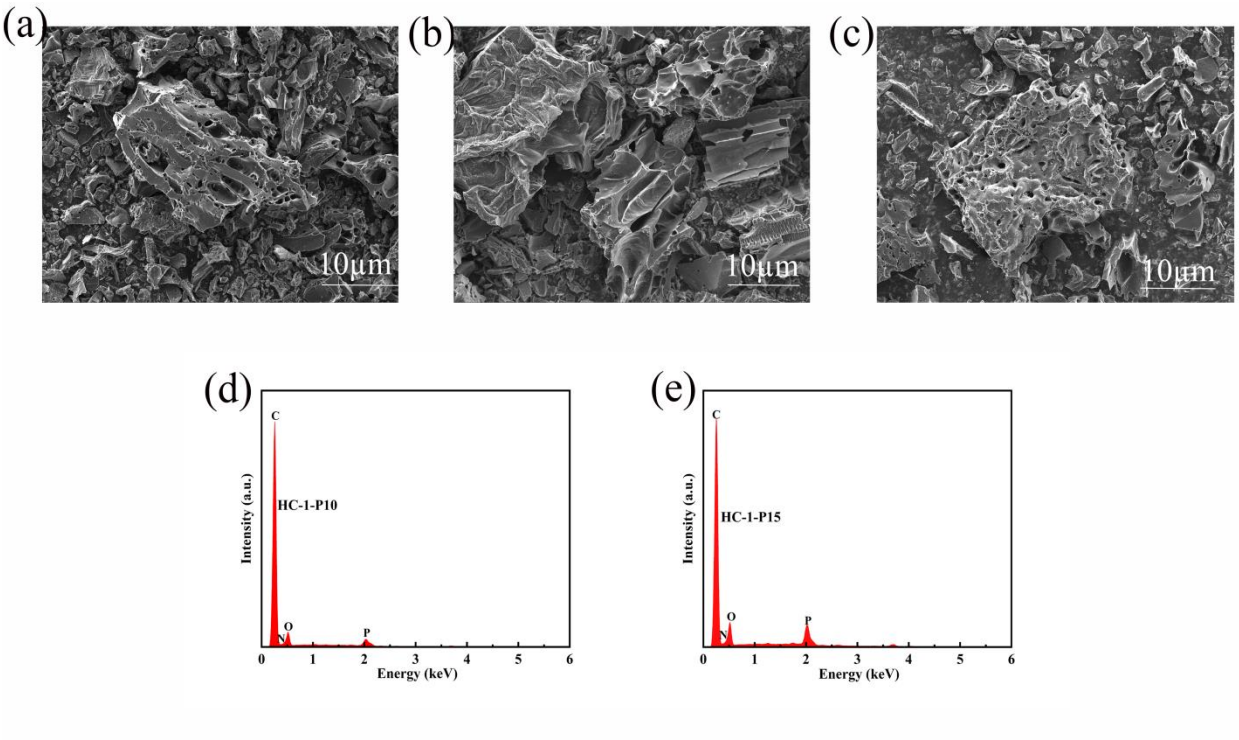

Fig. S5 (a-c) Small magnification SEM images of HC-1 at phosphorus contents of 5wt%, 10wt%, and 15wt%, respectively and (d-e) EDS images of HC-1-P10 and HC-1-P15.

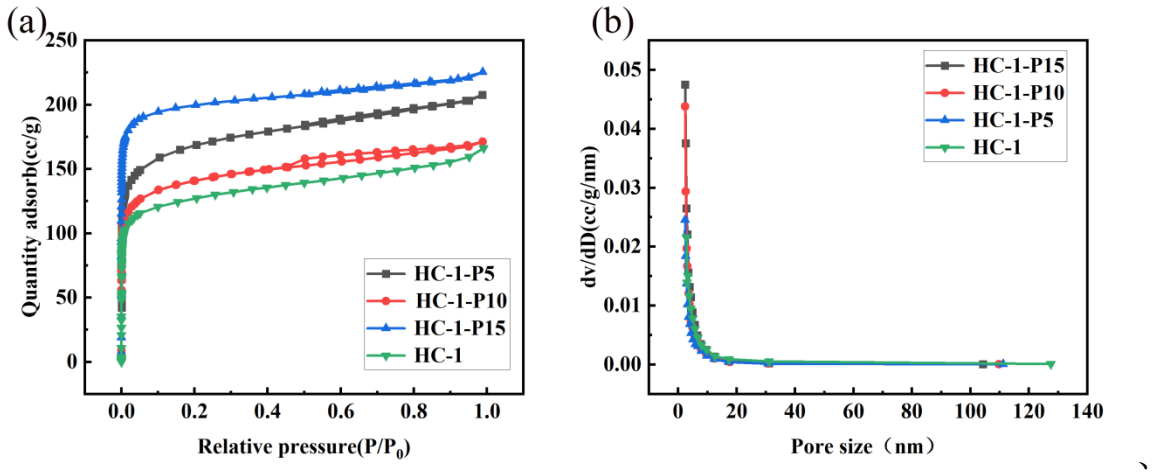

Fig. S6 (a) N_2 adsorption/desorption isothermal curves and (b) Pore size distribution function of HC-1 at phosphorus contents of 5wt%, 10wt%, and 15wt% respectively.

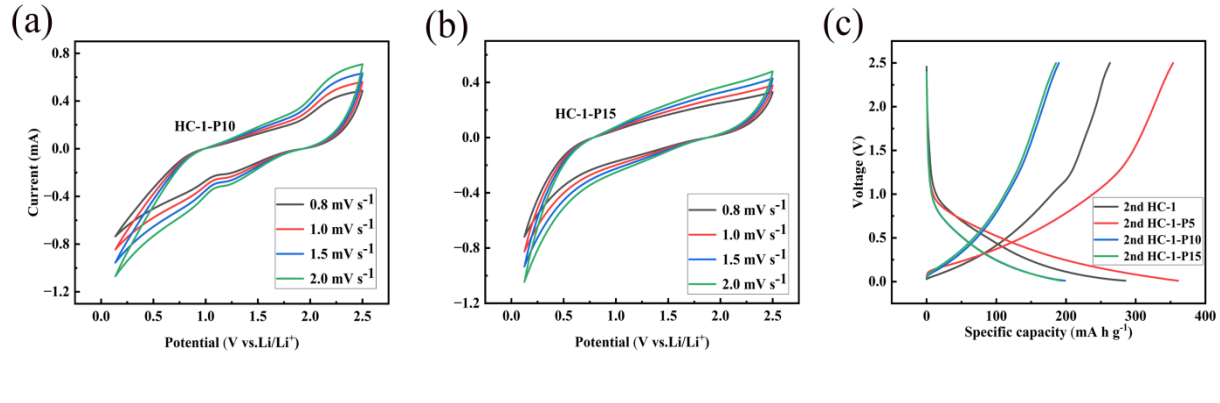

Fig. S7 (a-b) CV curves of HC-1-P10 and HC-1-P15 at different rates; (c) the second cycle galvanostatic charge/discharge curves of HC-1 at phosphorus contents of 5wt%, 10wt%, and 15wt% at 0.1 mA g^{-1}.