Supporting Information

Effect of activation ratio on the capacity of the carbon electrode of supercapacitors

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1. XPS and TGA analysis of raw material

The TG-DTA curve of raw materials at nitrogen atmosphere is shown in Fig. S1(a). The heating rate is 5 ℃ min^{-1}, and the temperature range is 25℃ to 800℃. Because the biogas residue contains water, the weight loss in the range of 25℃ to 250℃ is due to the evaporation of water, which absorbs a lot of heat. In the range of 250℃ to 500℃, the organic matter in the biogas residue are pyrolyzed, leading to significant weight loss and absorbing a lot of heat at the same time. The mass slowly decreases in the range of 500℃ to 800℃, which is mainly due to the carbonization of the humus decomposed difficultly as the temperature increases. In addition, N is retained because it is difficult to oxidize off the carbon skeleton without oxygen.

XPS survey spectra of raw material is showed in Fig. S1(b,c,d). The high-resolution C1s spectra of raw material was decomposed into three peaks at 284.8 eV, 286.4 eV and 288.2 eV and the functional group types are C = C / C-C , C-N/C-O and C = O, respectively. The N1s spectrum can be deconvoluted into different kinds of nitrogen groups at 399.55 eV, 400.16 eV, and 400.53 eV, corresponding to the pyridinic N (N-6), pyrrolic/pyrydone N (N-5) and quaternary N (N-Q), respectively. The high resolution O1s spectrum of the samples, which can be deconvoluted into C=O (531.40 eV), C-O-C (532.54 eV) and C-O (533.25 eV). Table S1 show the element composition of raw material by XPS, which is consistent with the results of TG-DTA analysis.

Table S1. Element composition of raw material by XPS

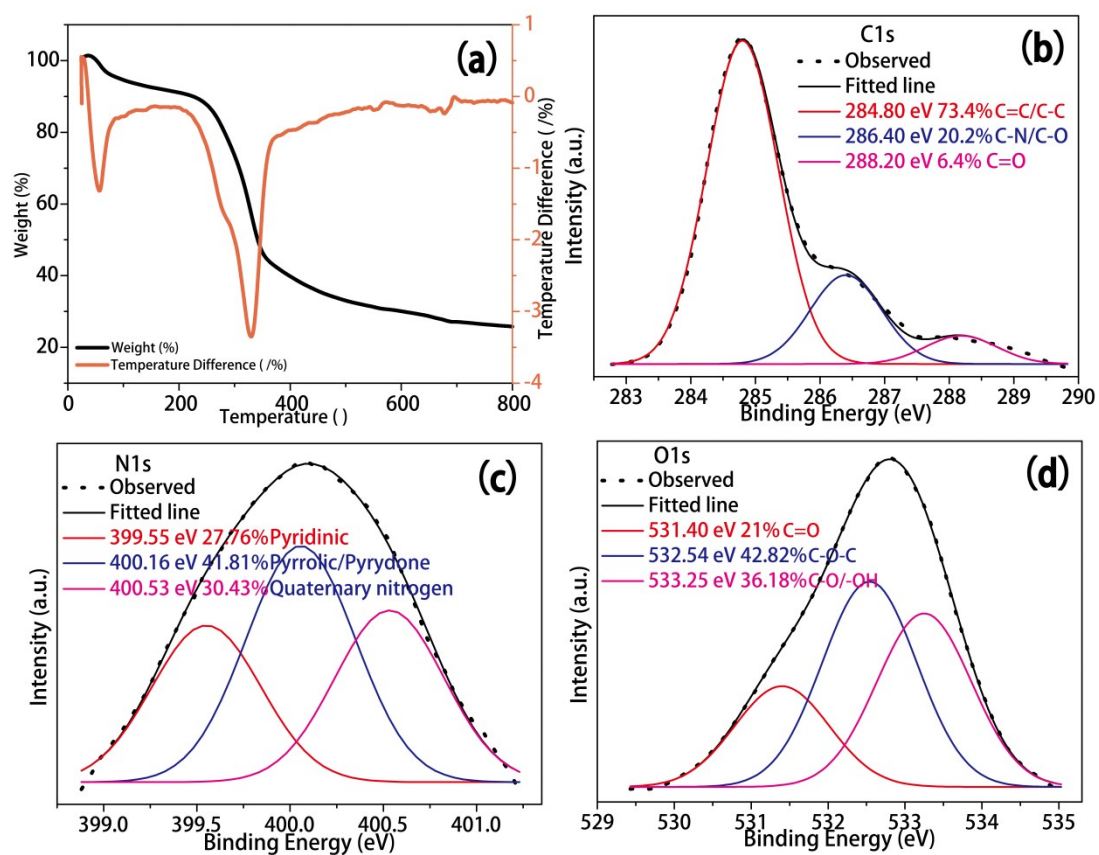| sample	C (wt%)	N (wt%)	O (wt%)
raw material	69.23	3.72	27.06

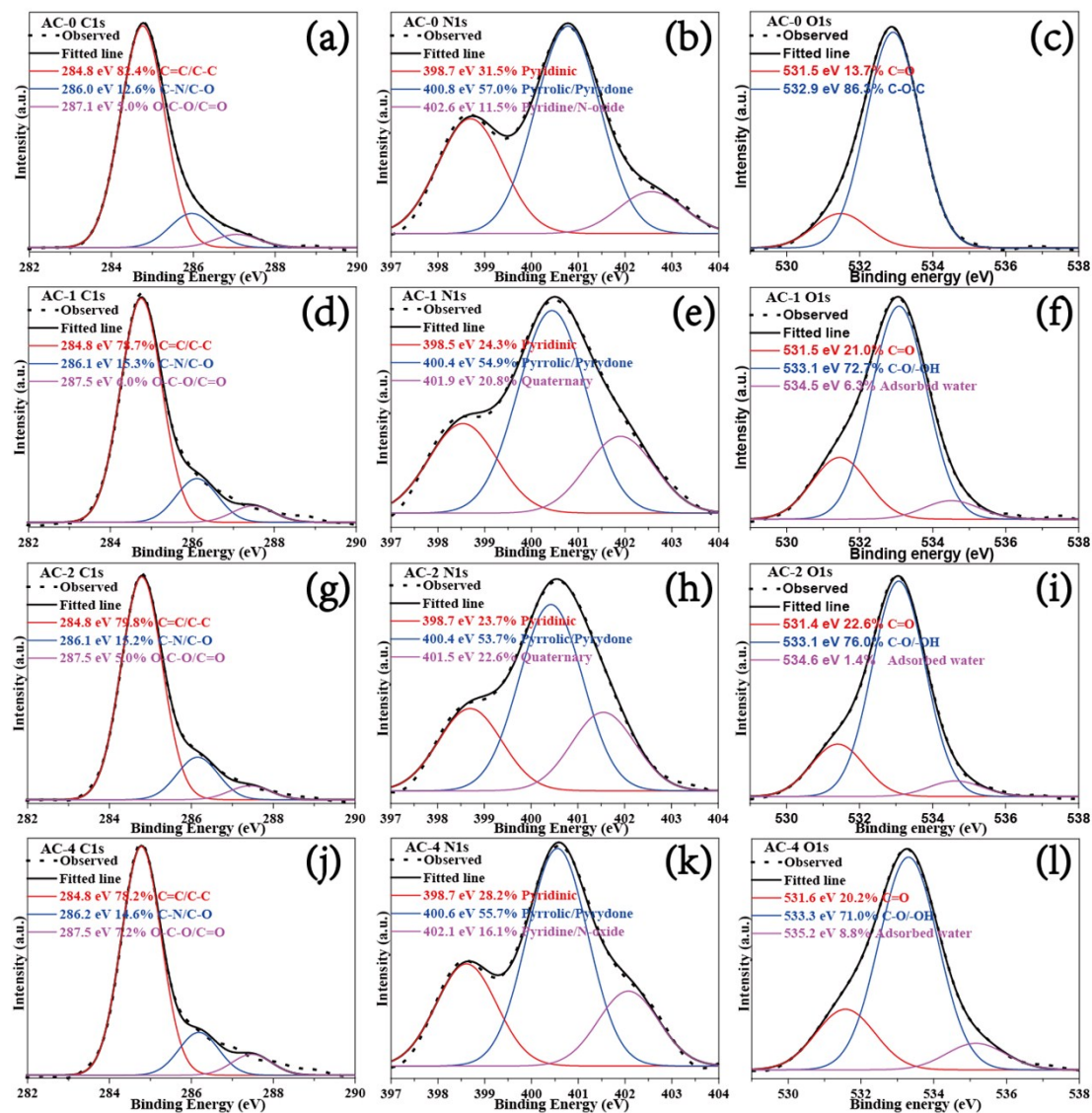**Fig. S1** (a) TG-DTA curve of raw materials, (b) C1s, (c) N1s and (d) O1s spectra of raw materials

Fig. S2 Deconvoluted high resolution XPS spectra of C1s, N1s and O1s for AC-0, AC-1, AC-2 and AC-4
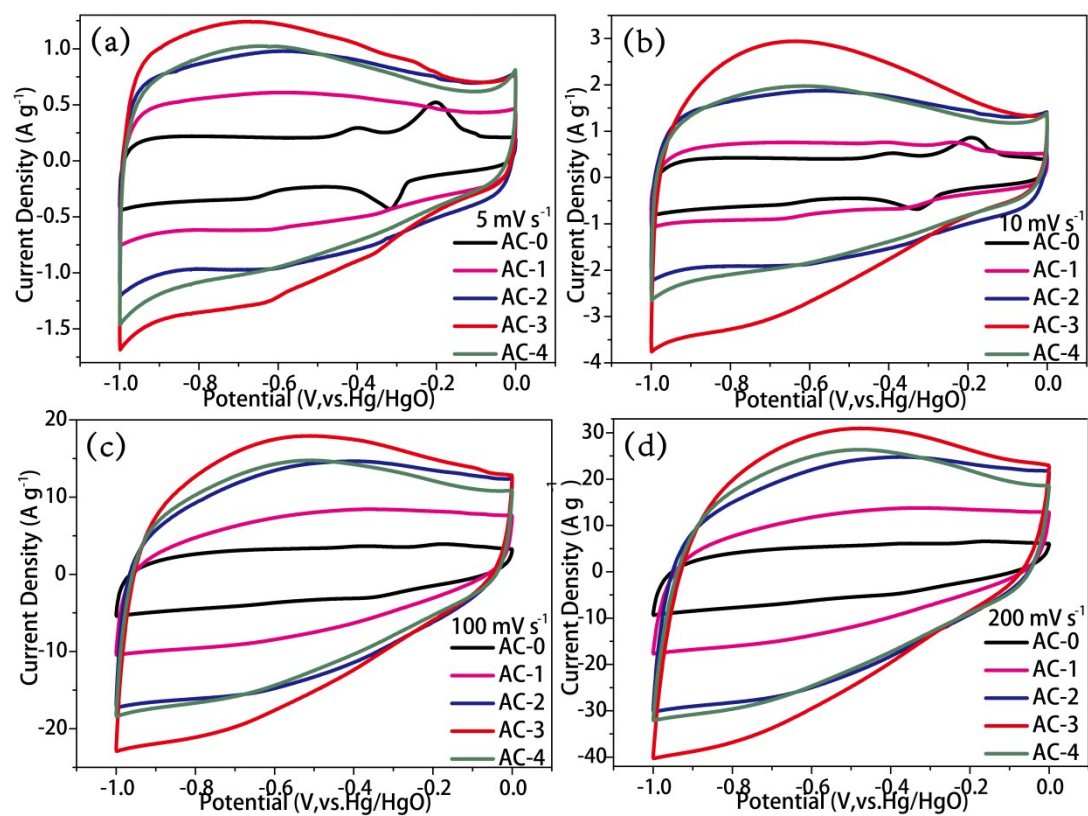
Fig. S3 Cyclic voltammetry (CV) measurements of AC-0, AC-1, AC-2, AC-3 and AC-4 in 6 M KOH aqueous solution over a potential range from -1 to 0 V at a scan rate of (a) 5 mVs⁻¹, (b) 10 mVs⁻¹, (c) 100 mVs⁻¹ and (d) 200 mVs⁻¹, respectively.
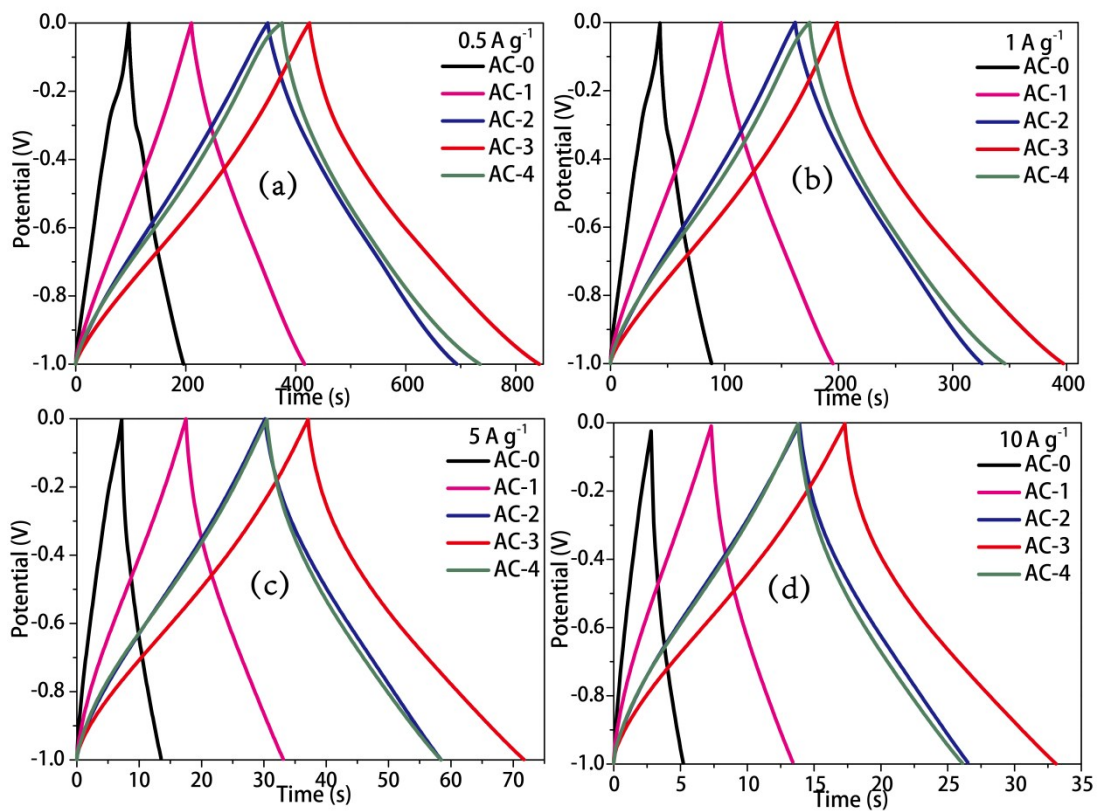
Fig. S4 Galvanostatic charge/discharge curves of AC-0, AC-1, AC-2, AC-3 and AC-4 at a current density of (a) 0.5 A g^{-1}, (b) 1 A g^{-1}, (c) 5 A g^{-1} and (d) 10 A g^{-1}, respectively.
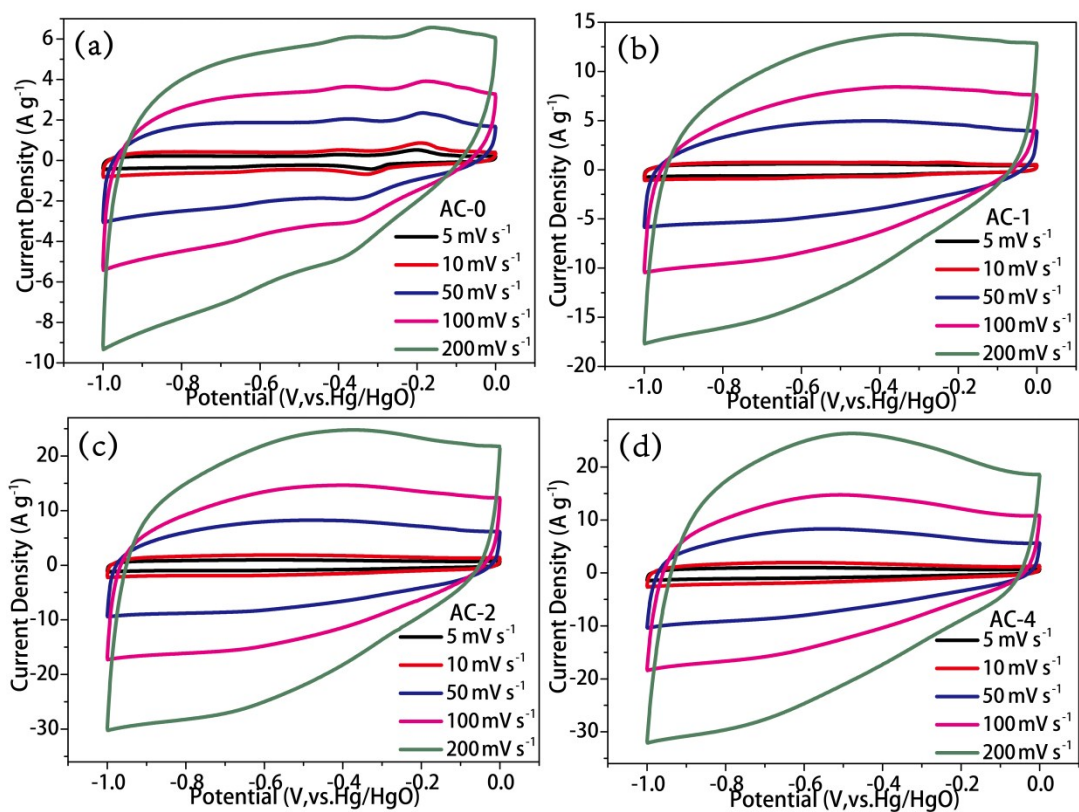
Fig. S5 Cyclic voltammograms of (a) AC-0, (b) AC-1, (c) AC-2 and (c) AC-4 at scan rates of 5, 10, 50, 100 and 200 mVs-1, respectively.
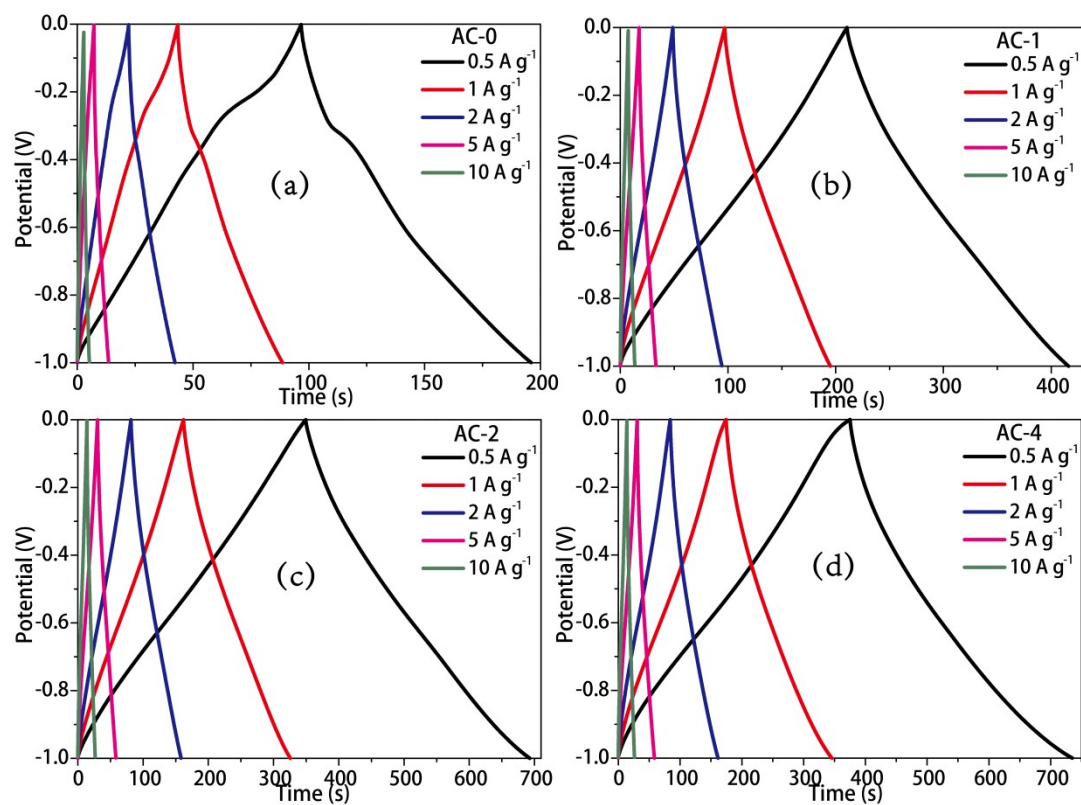
Fig. S6 Galvanostatic charge/discharge curves of (a) AC-0, (b) AC-1, (c) AC-2 and (d) AC-4 at current densities of 0.5, 1, 2, 5 and 10 A g^{-1}, respectively.
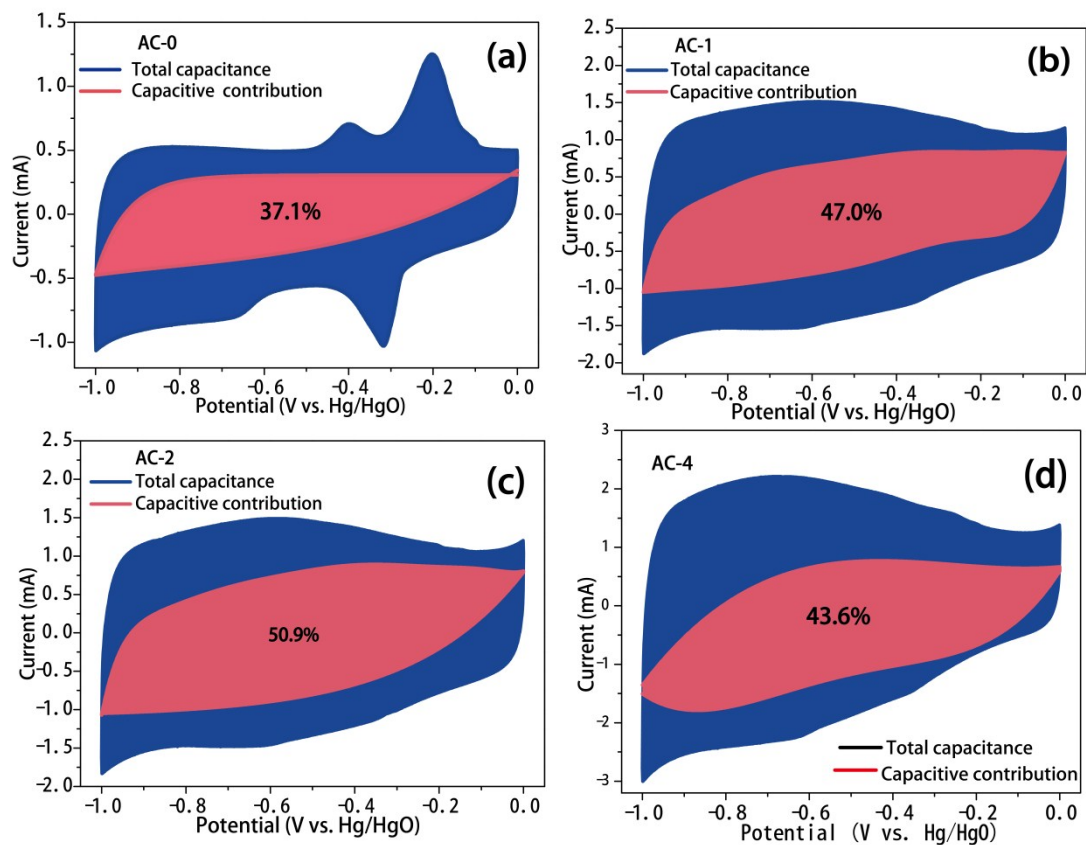
Fig. S7 CV curves at a scan rate of 5 mV s^{-1} expressing the pseudocapacitance contribution of (a) AC-0, (b) AC-1, (c) AC-2 and (d) AC-4 to the total capacitance.