Supporting information

Porous carbon derived from *Terminalia catappa* leaves for enhanced supercapacitive properties

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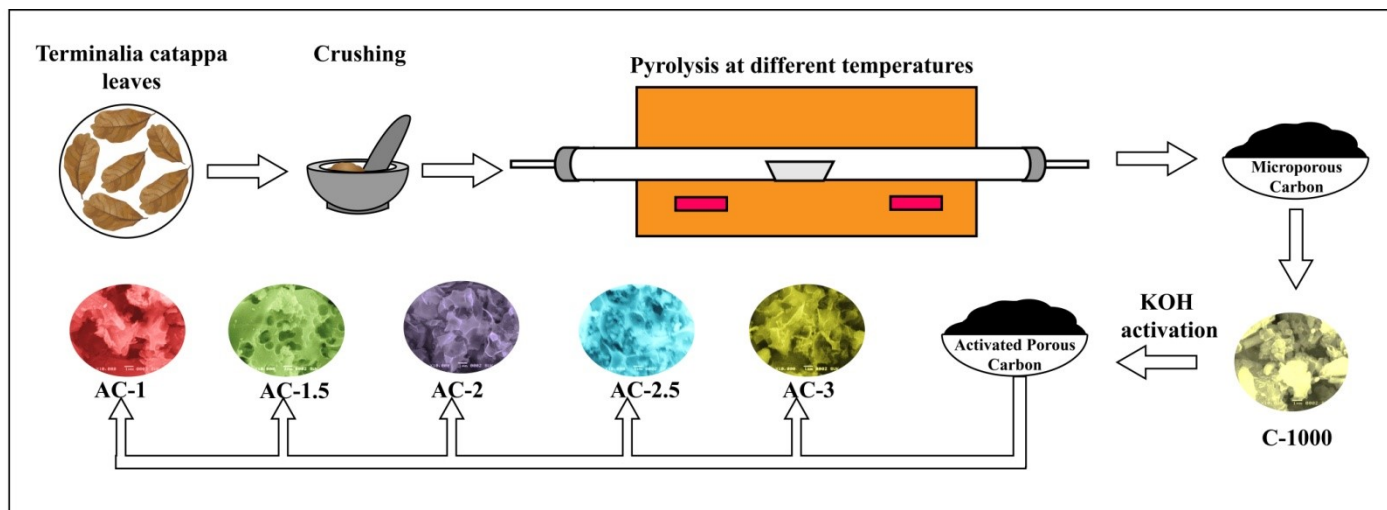
Figure captions:

Schematic caption:

Schematic S1: Schematic representation of the synthesis of hierarchical porous carbon from *Terminalia catappa* leaves for supercapacitor applications
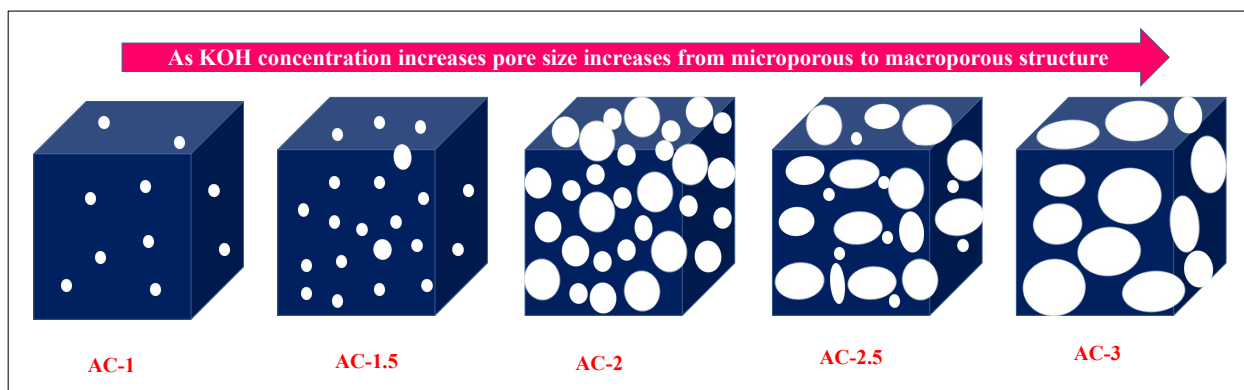
Schematic S2: Schematic representation of pore formation in carbon material with an increase in KOH mass ratio during KOH activation

Schematic S1:

Schematic S1: Schematic representation of the synthesis of hierarchical porous carbon from *Terminalia catappa* leaves for supercapacitor applications.

Schematic S2:

Schematic S2: Schematic representation of pore formation in carbon material with an increase in KOH mass ratio during KOH activation.
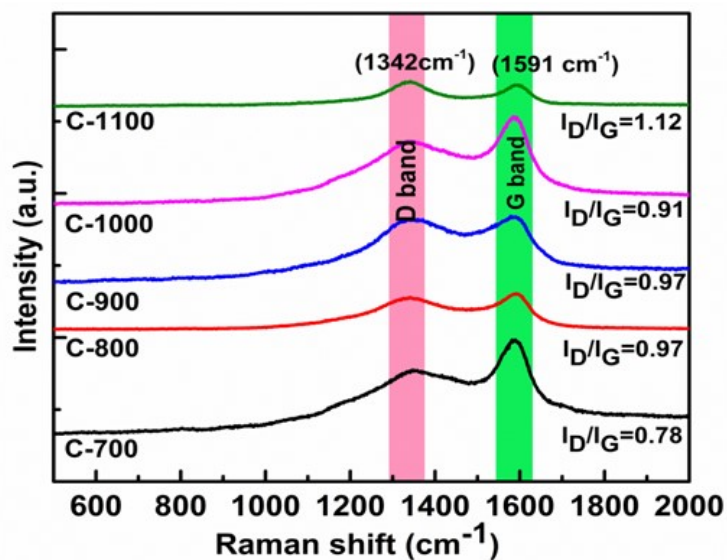
Fig. S1(a):

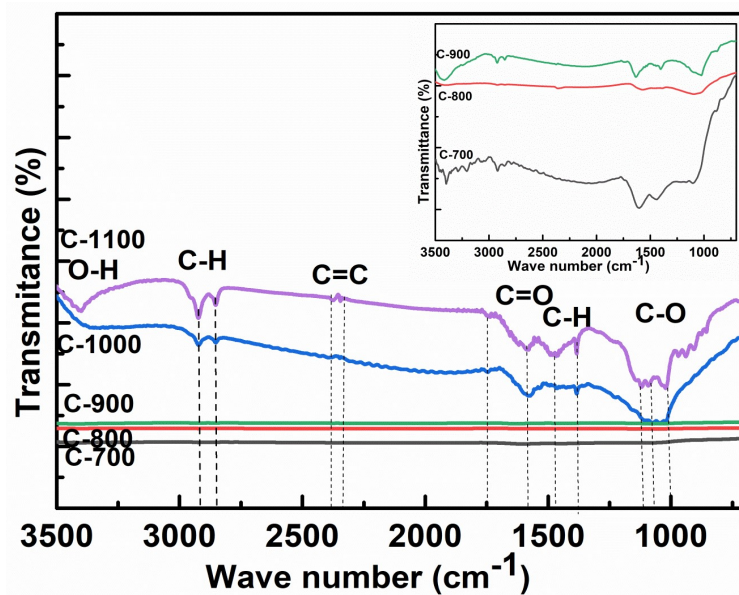**Fig. S1 (a):** Raman spectra of non-activated carbon samples (C-700, C-800, C-900, C-1000, C-1100)

Fig. S1(b)

Fig S1 (b): FTIR spectra of non-activated carbon samples (C-700, C-800, C-900, C-1000, C-1100)
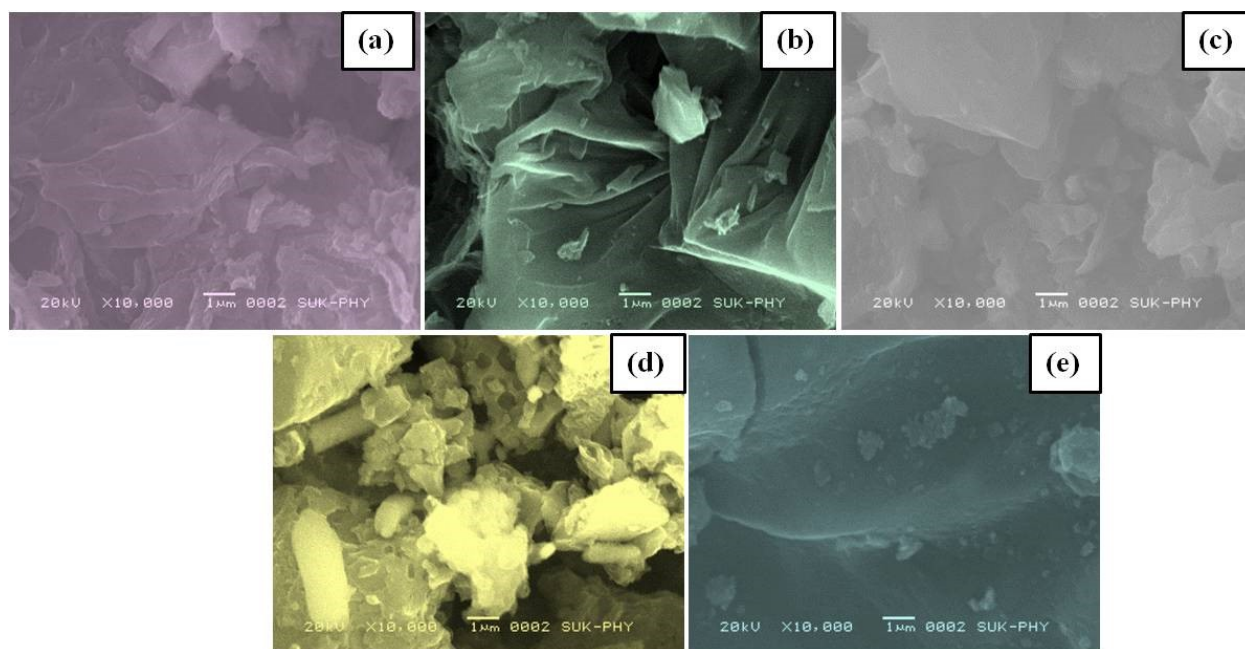
Fig. S2:

Fig. S2: SEM images of non- activated carbon samples (a) C-700, (b) C-800, (c) C-900, (d) C-1000, (e) C-110
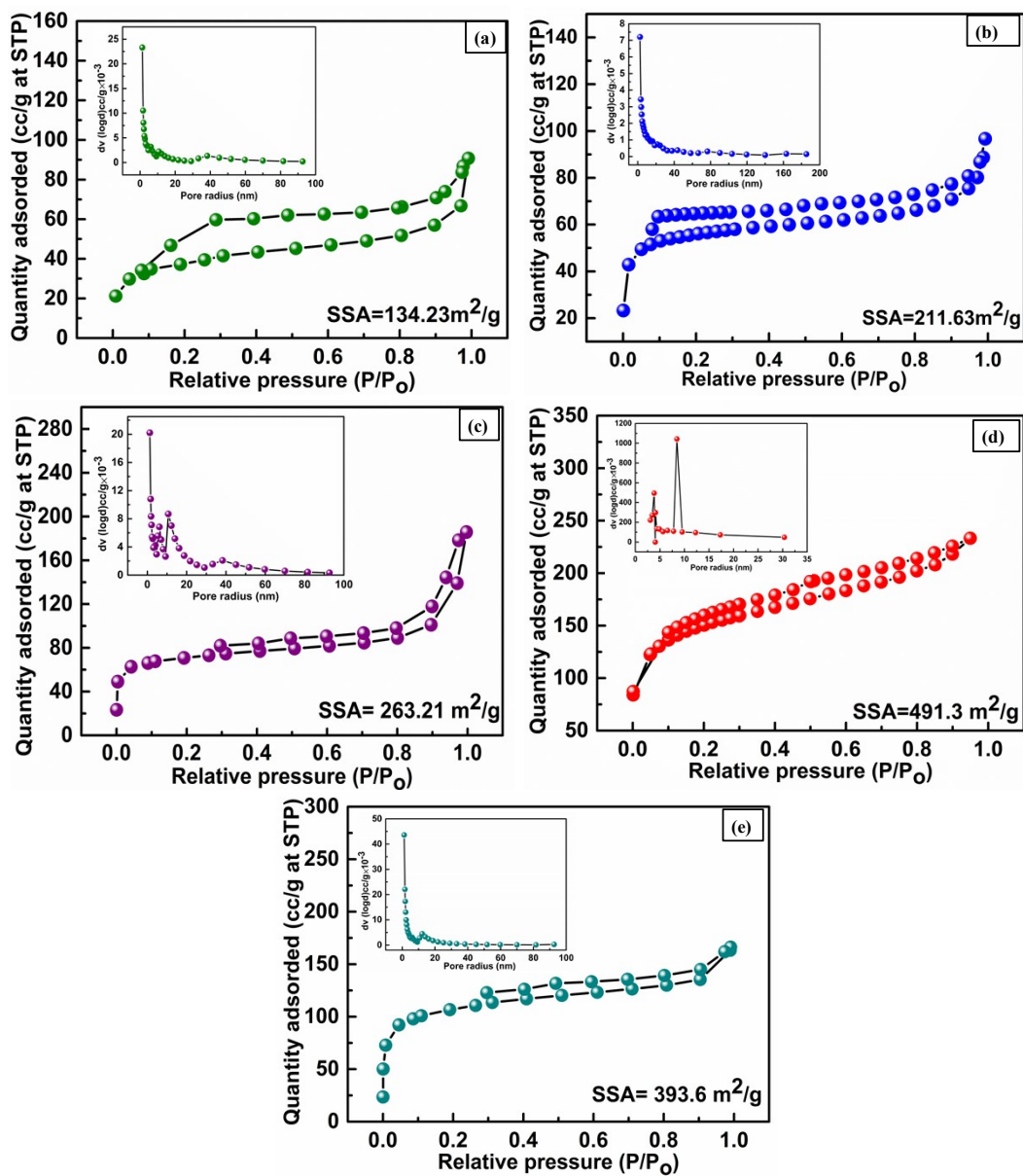
Fig. S3:

Fig. S3: N_2 adsorption-desorption isotherm of carbon samples at 77 K (a) C-700, (b) C-800, (c) C-900, (d) C-1000, (e) C-1100 and inset shows the corresponding BJH curve.

Table S1

Sr. No	Sample code	SSA(m^2/g)	Pore radius (nm)	Pore volume (cm^3/g)
1.	C-700	134.23	4.11	0.13
2.	C-800	211.63	2.71	0.14
3.	C-900	263.21	1.22	0.17
4.	C-1000	491.3	2.93	0.36
5.	C-1100	393.6	2.58	0.25

Table S1: Values of specific surface area, average pore radius and pore volume of C-700, C-800, C-900, C-1000, and C-1100 estimated from BET analysis.
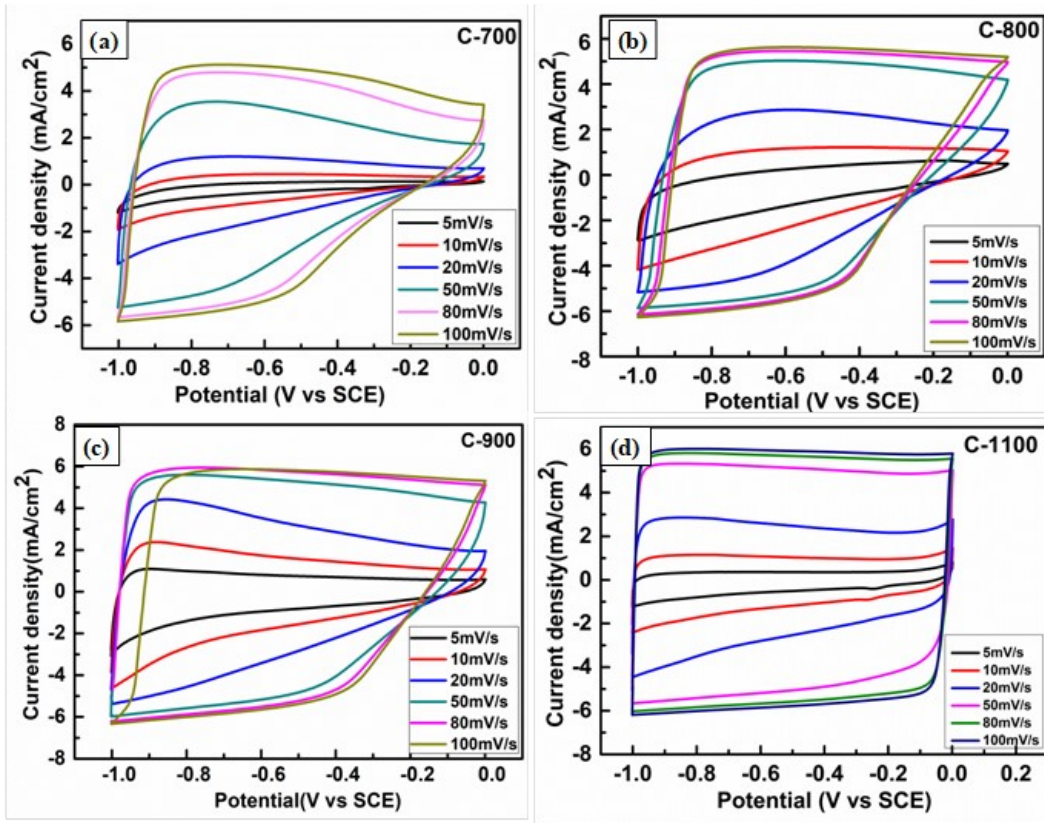
Fig. S4:

Fig S4: Cyclic voltammetry (CV) of (a) C-700, (b)C-800, (c) C-900 and (d) C-1100 samples at different scan rates ranging from 5 to 100 mV/s.
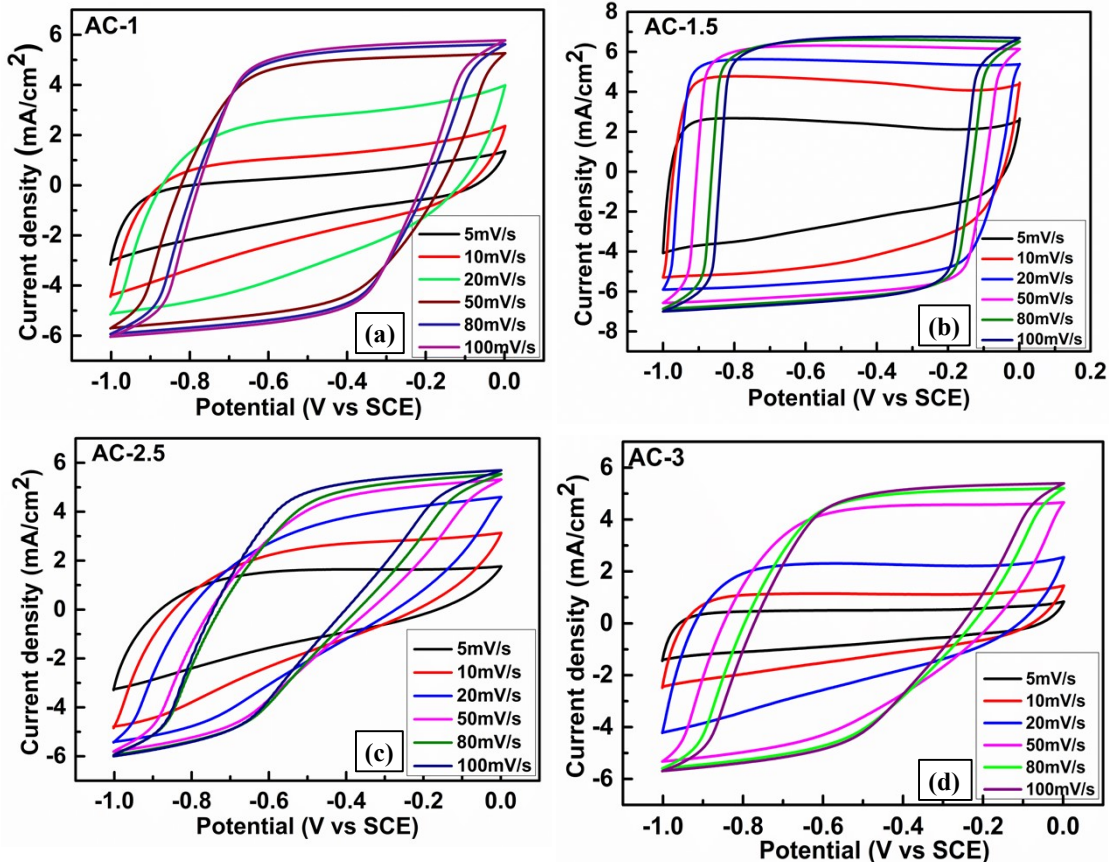

Fig S5:

Fig S5: Cyclic voltammetry of (a) AC-1, (b) AC-1.5, (c) AC-2.5 and (d) AC-3 at different scan rates.

Fig S6:
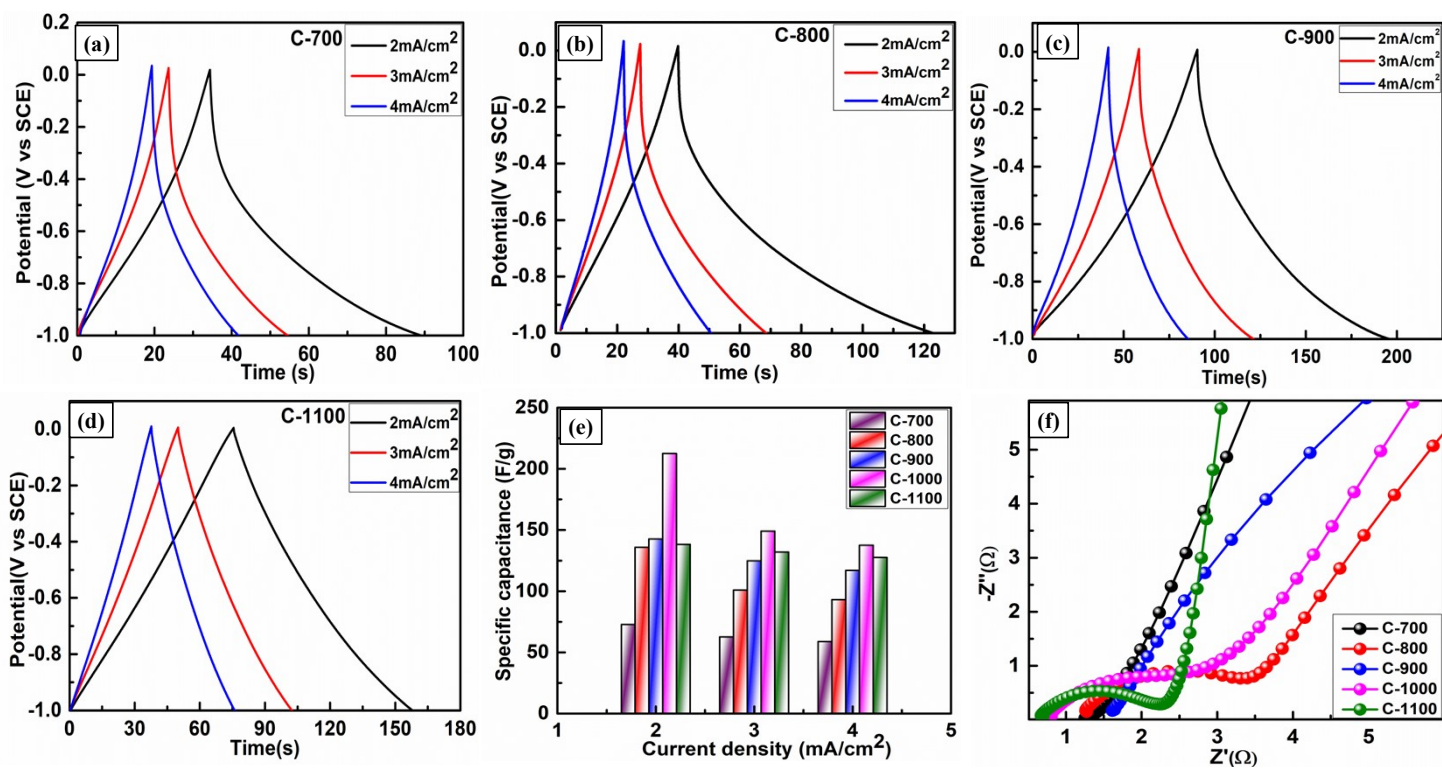
Fig S6: GCD measurements of (a) C-700, (b) C-800, (c) C-900, (d) C-1100 samples at different current densities, (e) graph of specific capacitance as a function of current density, (f) Nyquist plot for all samples.
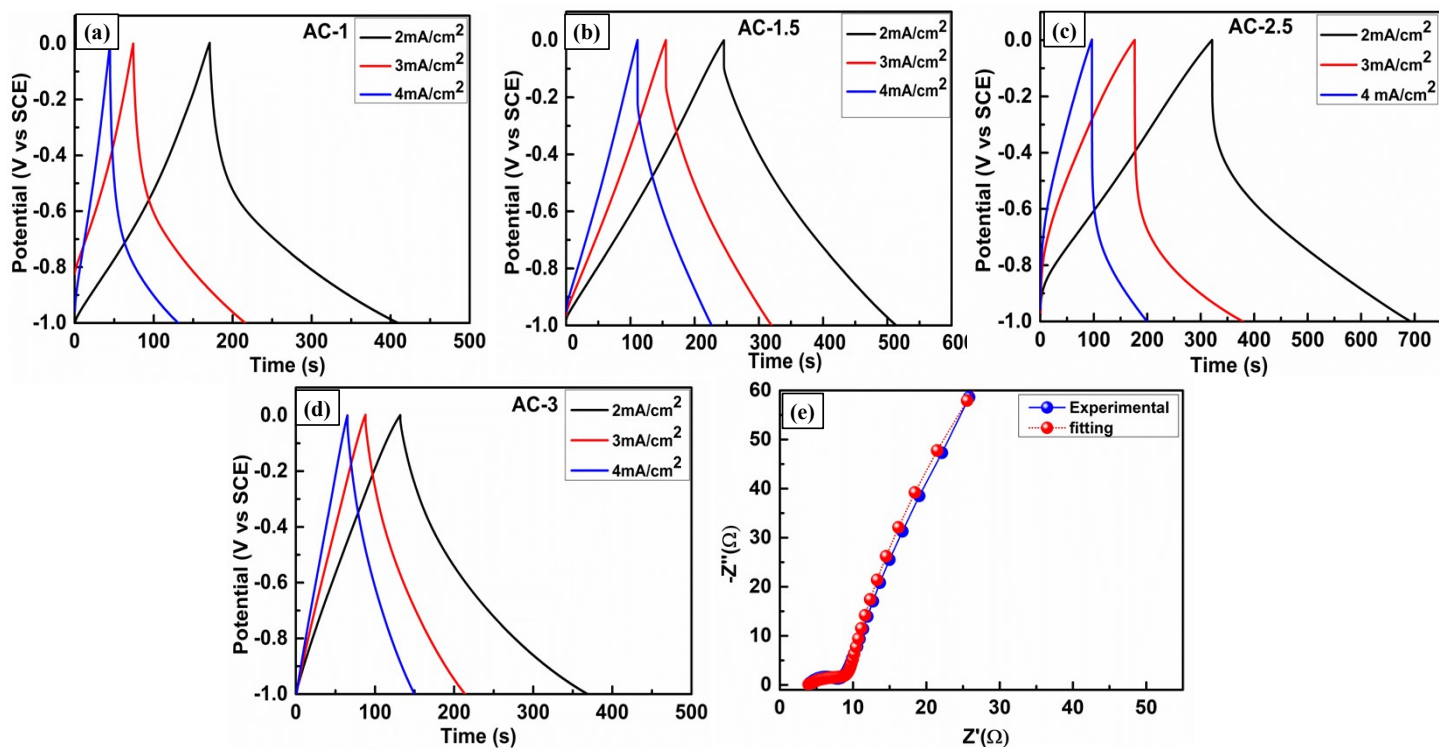
Fig S7:

Fig S7: GCD measurements of a) AC-1, (b) AC-1.5, (c) AC-2.5 and (d) AC-3, (e) EIS plot and fitting curve for AC-2 sample with equivalent circuit in the inset.

Table S2

Sample code	Specific capacitance (F/g) at 2 mA/cm^2	Energy density (Wh/kg)	Power density (W/kg)	R_s (Ω)	R_{ct} (Ω)
C-700	109	15.14	1000	1.28	-
C-800	135.8	18.86	833.3	1.24	2.38
C-900	142.6	19.81	666.6	1.57	-
C-1000	212.4	29.50	500	0.79	1.92
C-1100	138.2	19.20	833.3	0.65	1.72

Table S2: Values of specific capacitance, energy density, power density, R_s and R_{ct} for C-700, C-800, C-900, C-1000, and C-1100 from charge discharge curves at 2 mA/cm^2 current density.

S1: All solid state polymer gel electrolyte AC-2// AC-2 symmetric device fabrication:

S1.1 Preparation of polymer (PVA-KOH) gel electrolyte:

For fabrication of the AC-2//AC-2 symmetric device, PVA-KOH was used as both gel electrolyte as well as separator. For preparing PVA-KOH gel, 5 gm of PVA was dissolved in 50 ml DDW at 343 K. A separate solution KOH was prepared by dissolving 5 gm KOH pellets in 10 ml of DDW and was added dropwise in PVA containing solution. This solution was stirred at a

constant temperature (343 K) till it become viscous. Then, this viscous solution was cooled at room temperature and used as a gel electrolyte for symmetric device fabrication.

S1.2 Fabrication of all solid state symmetric device:

The basic structure of a supercapacitor device consists of two electrodes separated by the separator which avoids the physical contact between two electrodes and allows only the ion transfer between them. For device fabrication, electrodes were made by deposition of AC-2 sample on a 2 cm × 3 cm area of flexible stainless steel substrate by same procedure discussed in section 2.3. Firstly, the side edges of electrodes were made non-conducting by rapping with an insulating band to avoid electrical contact. Further, PVA-KOH gel was pasted on both the electrode on the deposistion side and dried at room temperature. The contact were made at one end of both electrode for electrical contact. After that deposited sides of electrodes were packed together with facing each other by an insulating band. To obtain a good contact between the electrode and gel electrolyte and to remove the air gap, the device was kept under 1 ton pressure for 5 minutes. Then after, the device was further used for evaluation of electrochemical performance.

The specific capacitance of the symmetric device has been calculated by the following formula:

$$C = \frac{I \times \Delta t}{m \times V} \qquad \text{-------------------- S1}$$

Where, $m = \dfrac{m_1 \times m_2}{m_1 + m_2}$; m_1 and m_2 are mass of each electrode. For symmetric device, $m_1 = m_2$.
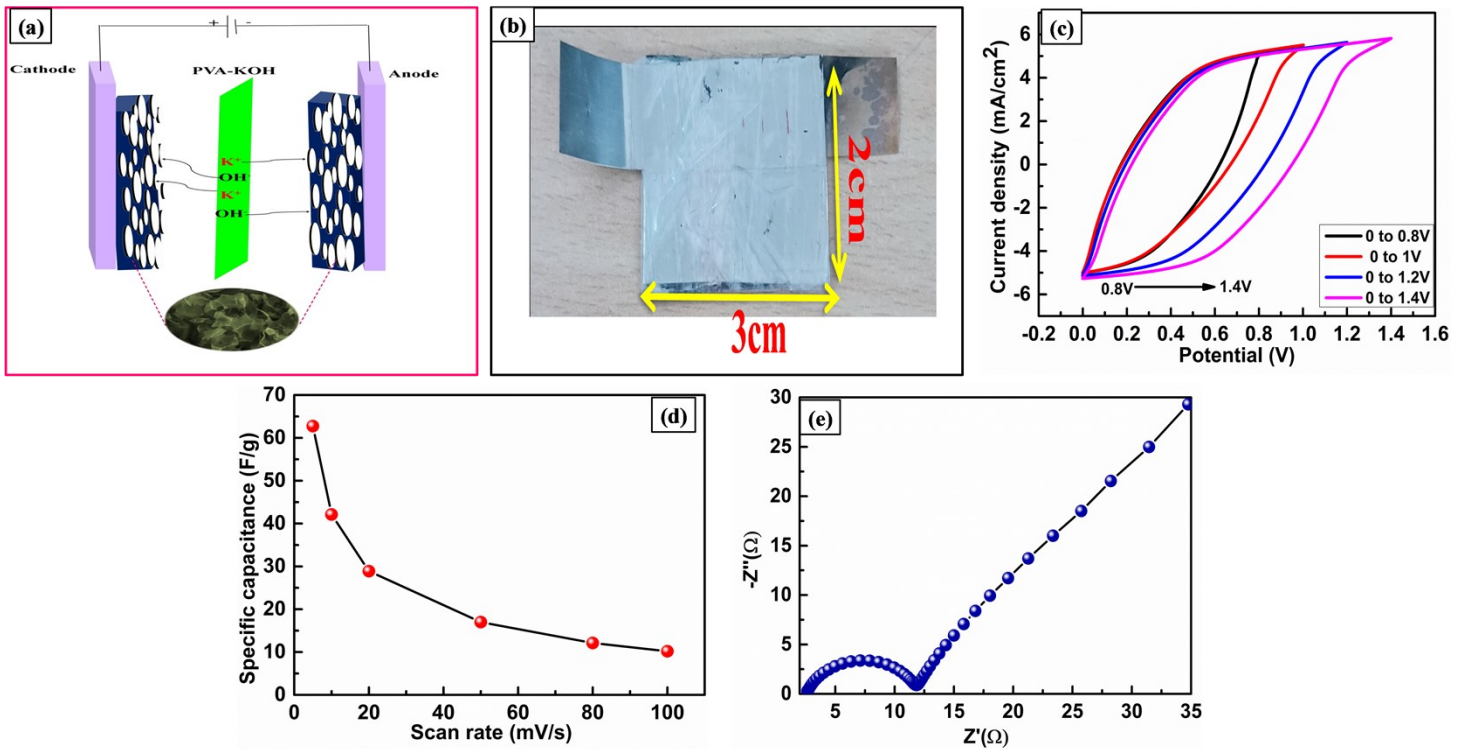
Fig.S8:

Fig.S8: (a) Schematic representation of device fabrication, (b) Digital photograph of AC-2//AC-2 symmetric device, (c) Potential window variation of AC-2//AC-2 symmetric device at scan rate of 100 mV/s, (d) graph of specific capacitance as a function of scan rate, (e) Nyquist plot for AC-2//AC-2 symmetric device.