
Supplementary Information

Natural-Gel Derived, N-doped, Ordered and Interconnected 1D Nanocarbon Threads As Efficient Supercapacitor Electrode Material

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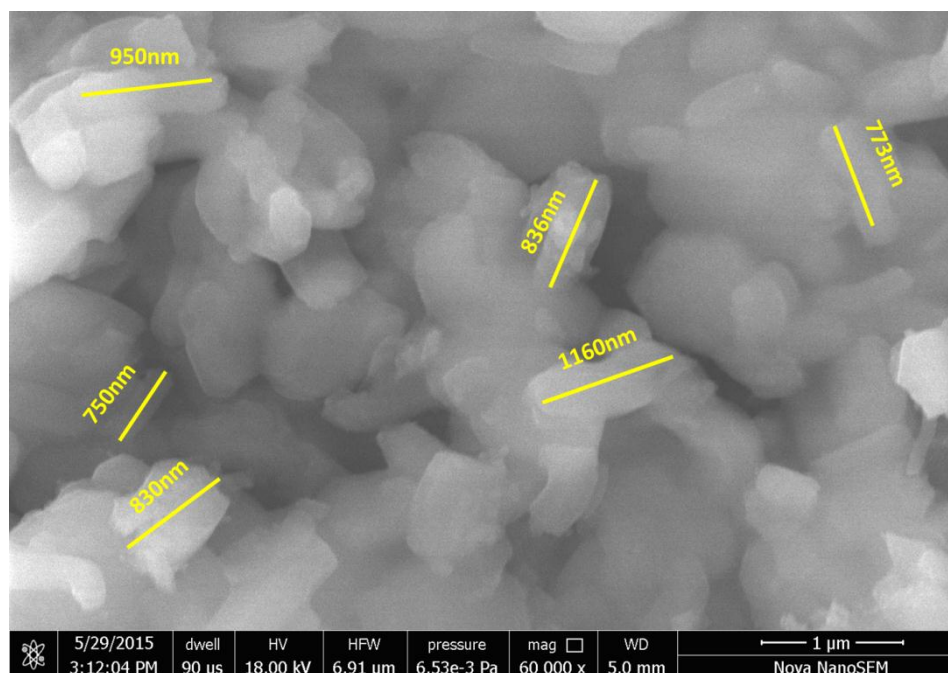


Fig. S1 FE-SEM image of SBA-15 particles

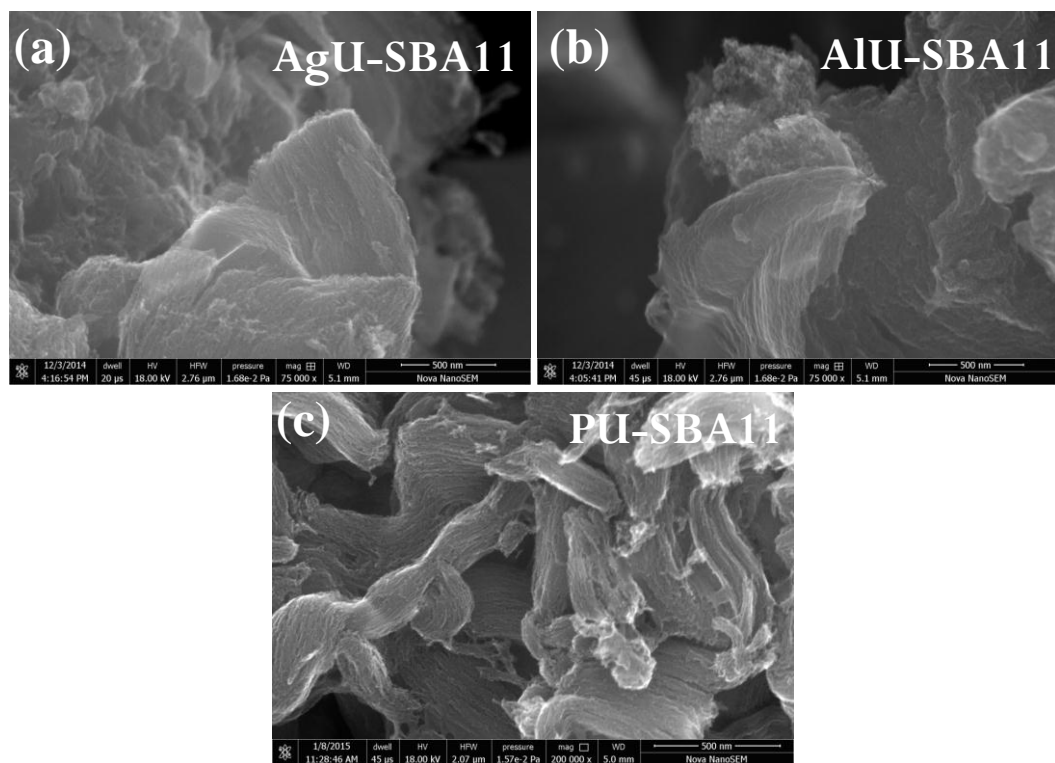
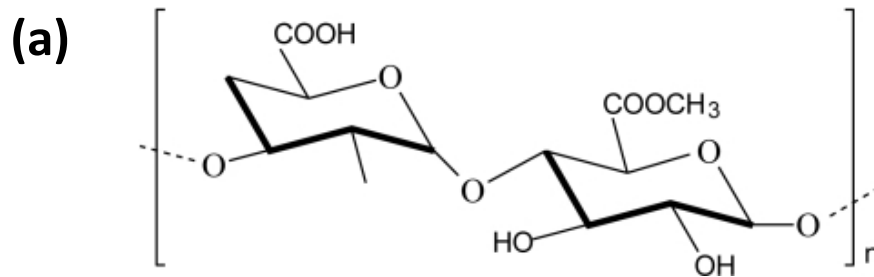
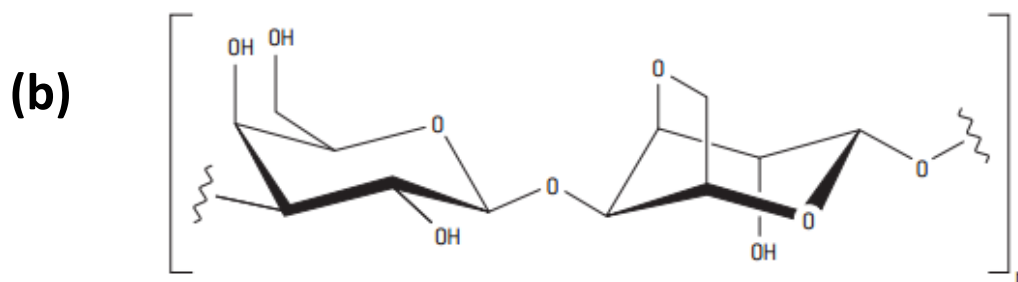


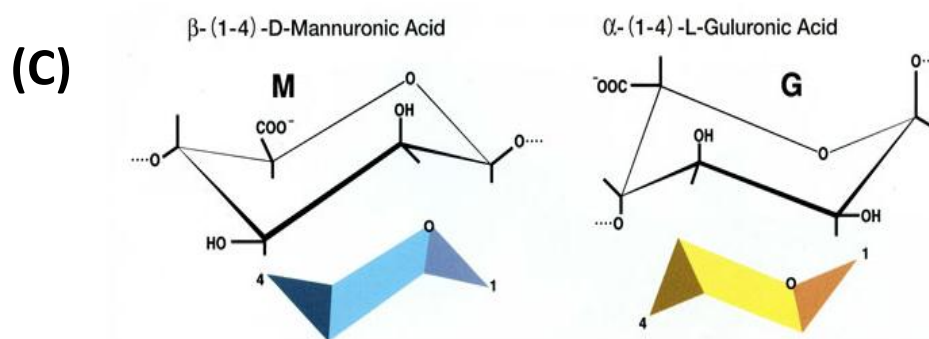
Fig. S2 FE-SEM images of three natural gels: **a)** Agarose -Urea gel, **b)** Na-Alginate-Urea gel, **c)** Pectin-Urea gel.



Pectin is a polymer of modified sugar, galacturonic acid and in the plant the its carboxyl groups are esterified with methyl (CH₃) groups which are not shown in the picture



Agarose is a polysaccharide consisting of 1,3-linked β -D-galactopyranose and 1,4-linked 3,6-anhydro- α -L-galactopyranose.



Alginic acid, a polysaccharide is composed of two types of Uronic acid.

Fig. S3 Shows the chemical structure of the three natural gel, **a**) Pectin {courtesy: http://openi.nlm.nih.gov/detailedresult.php?img=2866488_marinedrugs-08-01305f4&req=4}

b) Agarose {courtesy: http://bio.lonza.com/uploads/tx_mwaxmarketingmaterial/Lonza_BenchGuides_SourceBook_Appendix_B_-_Agarose_Physical_Chemistry.pdf}

c) Alginate {courtesy: http://www.kimica-alginate.com/alginate/chemical_structure.html}

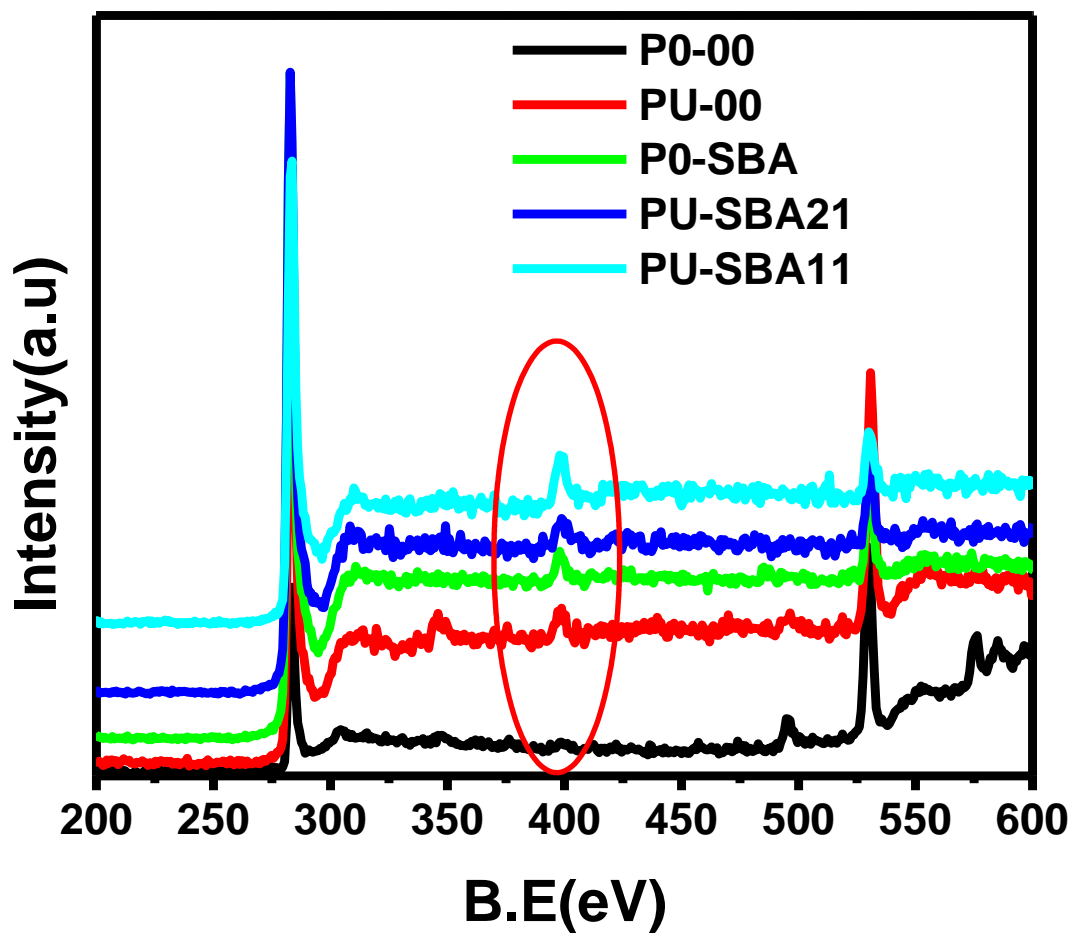


Fig. S4 Comparative Survey XPS spectra all pectin derived samples.

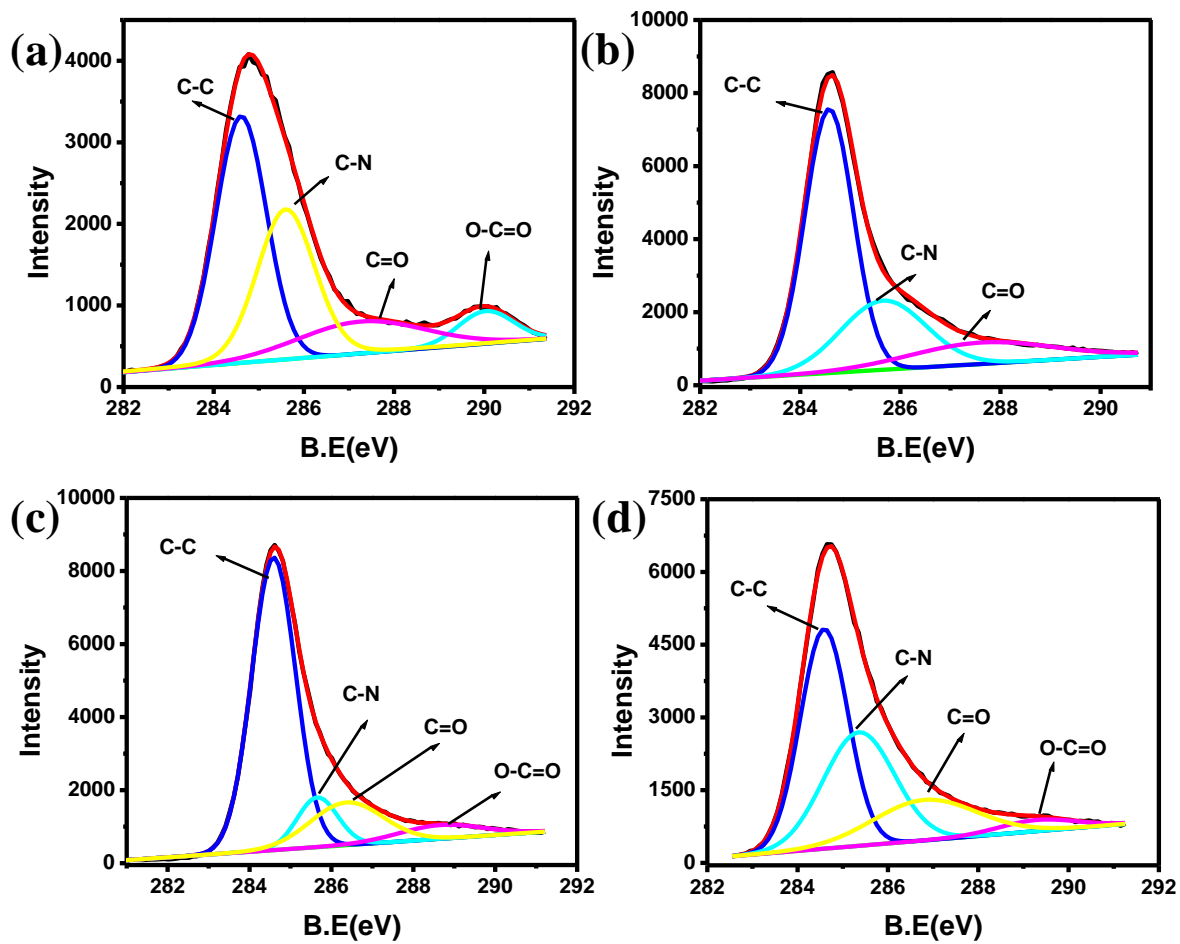


Fig. S5 Deconvoluted Carbon 1S spectra of all pectin derived carbons.

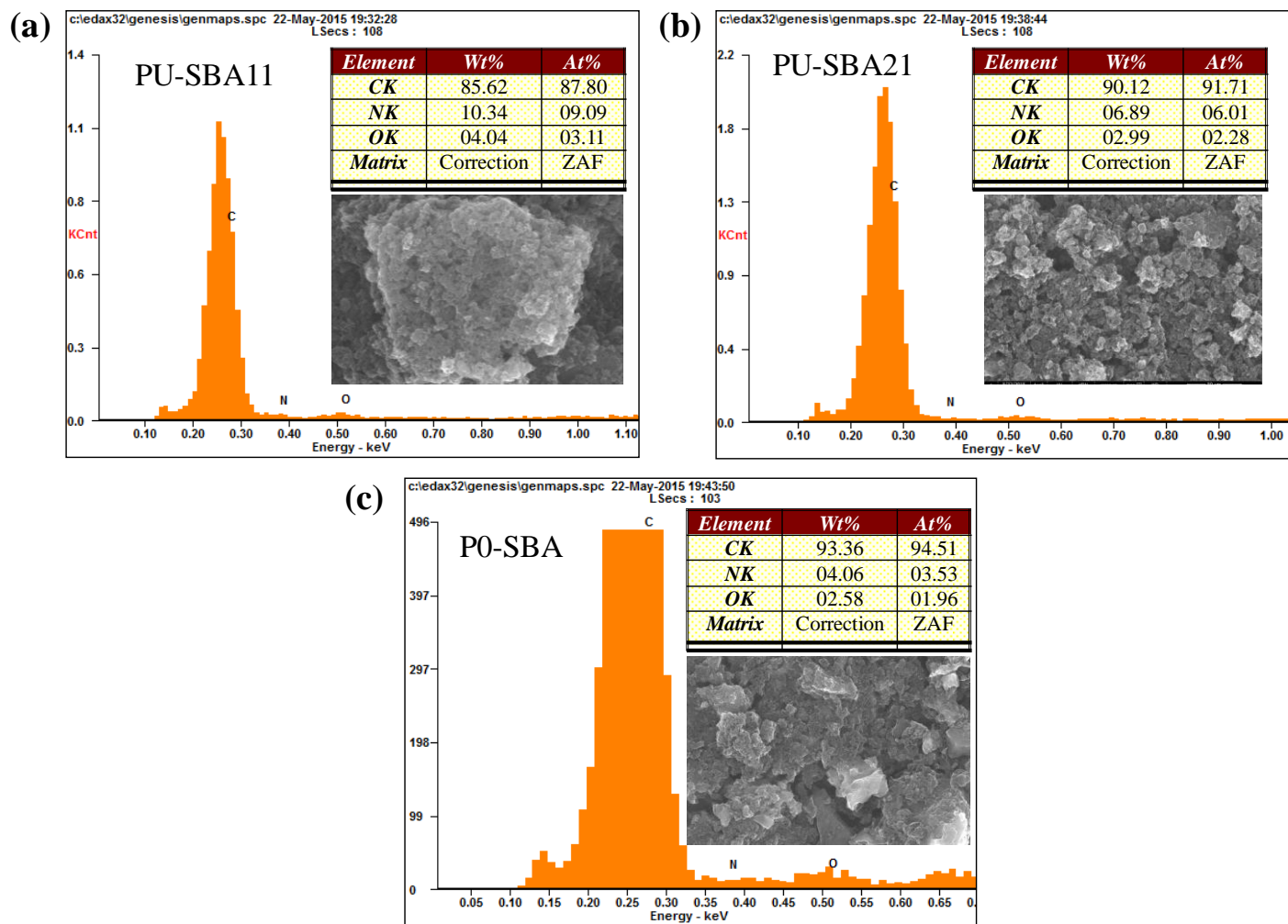


Fig. S6 EDS spectra of three pectin derived carbon forms along with the atomic percentage of C, O, and N . a) PUSBA11, b) PUSBA21, c) P0-SBA

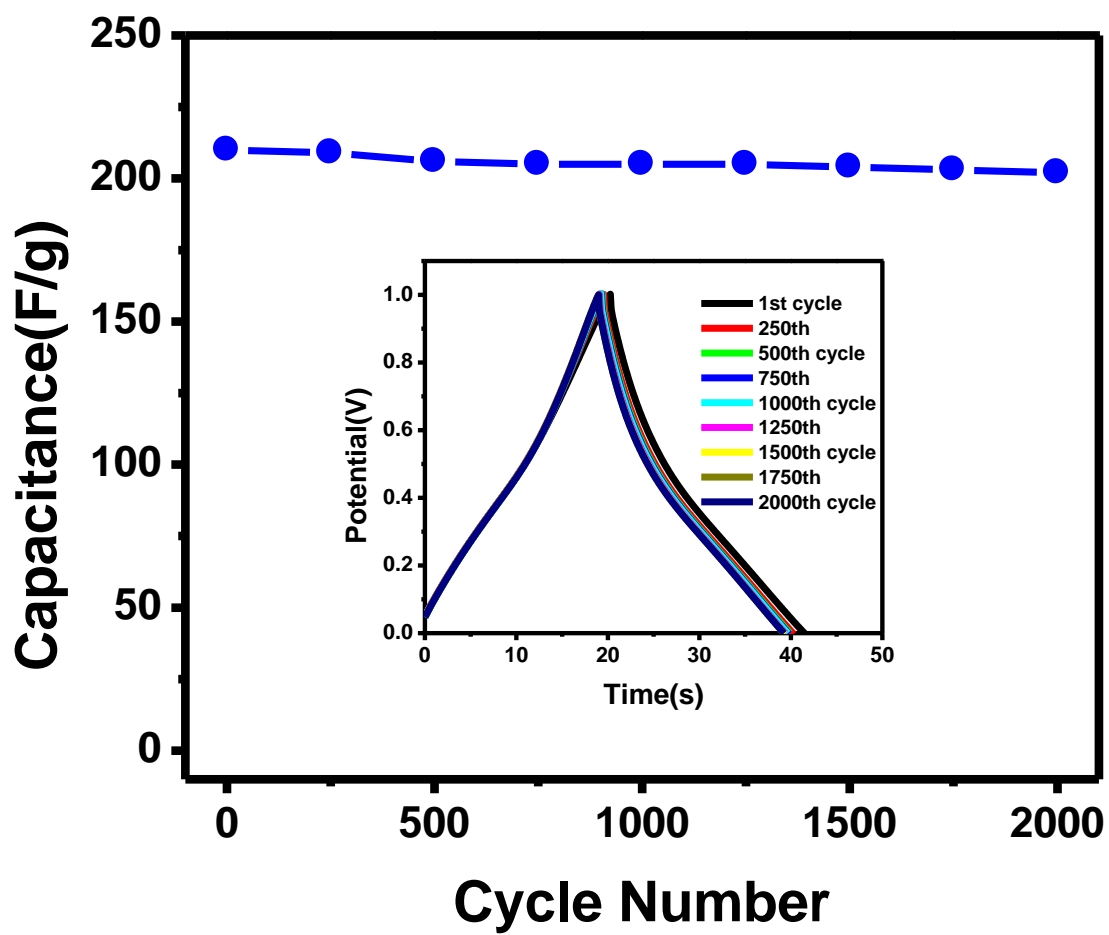


Fig. S7 Shows the cyclic stability measurements of PU-SBA11 at current density of 10A/g in a three electrode cell using 1M H_2SO_4 as electrolyte vs calomel reference electrode.

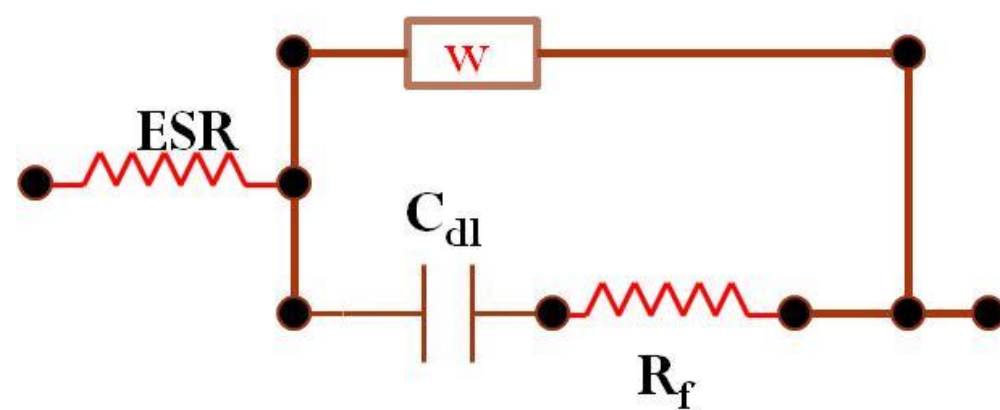


Fig. S8 Equivalent circuit used to fit the impedance data of all the synthesized carbon materials. Circuit is characterized by presence of a Warberg impedance element **W** in parallel to double layer capacitance, and a element of resistance **R_f** in series with double layer capacitance **C_{dl}**, connected to an external resistance **ESR** .

Table. T1 Summarizes the electrochemical performance of all different gel derived carbons

Samples	Capacitance (F/g) (charge discharge)		Impedance Analysis			
	1A/g	10A/g	ESR(Ω)	C_{dl}(F/cm²)	R_f(Ω)	W (mMho)
P0-00	20	12	2.97	11	0.454	12
PU-00	60	55	2.57	42	0.624	13
P0-SBA	226	160	2.26	104	0.362	49
PU-SBA21	240	180	2.07	154	0.389	17
PU-SBA11	285	210	1.61	207	0.142	15
AgU-SBA11	10	100	2.9	89	0.628	60
AIU-SBA11	110	160	2.5	112	0.350	85

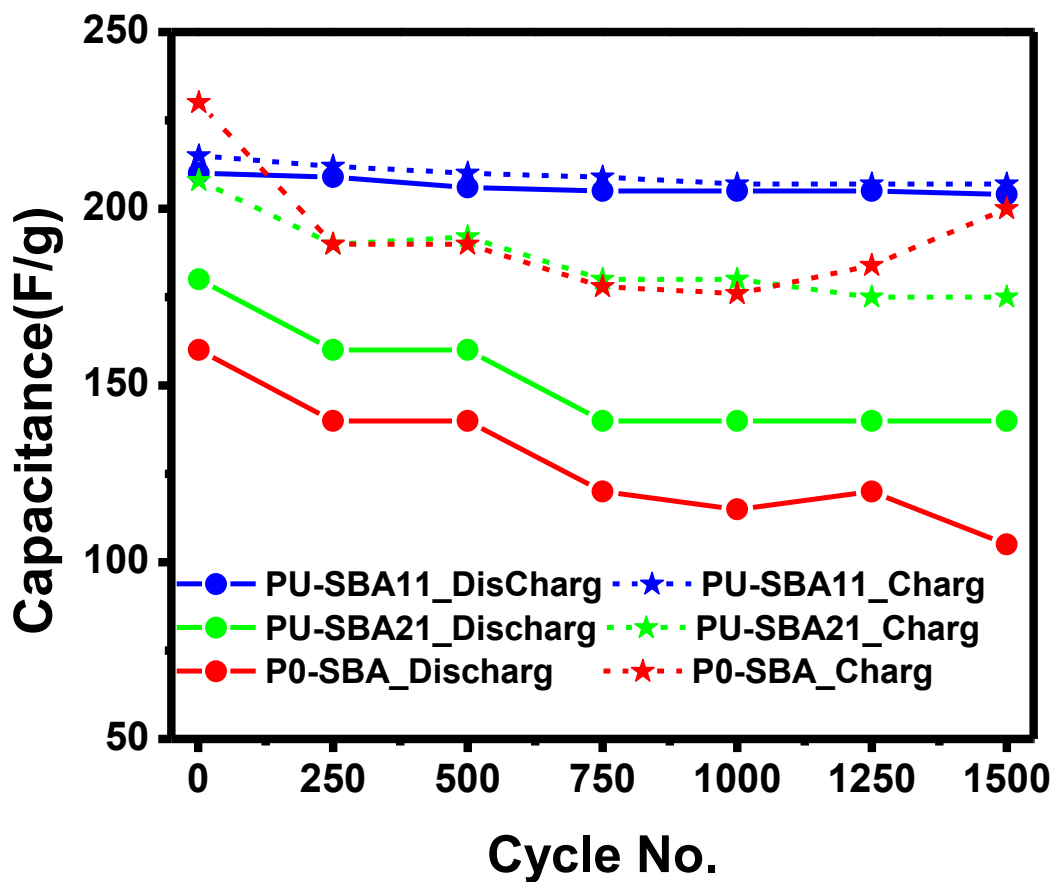


Fig. S9 Shows the cyclic stability data of PU-SBA11, PU-SBA21, and P0-SBA at Current density of 10A/g in a three electrode cell using 1M H_2SO_4 as electrolyte vs calomel reference electrode up to 1500 charge discharge cycles.