Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Nitrogen- and Sulfur-Enriched Porous Carbon from Waste Watermelon Seeds for High-Energy, High-Temperature Green Ultracapacitors

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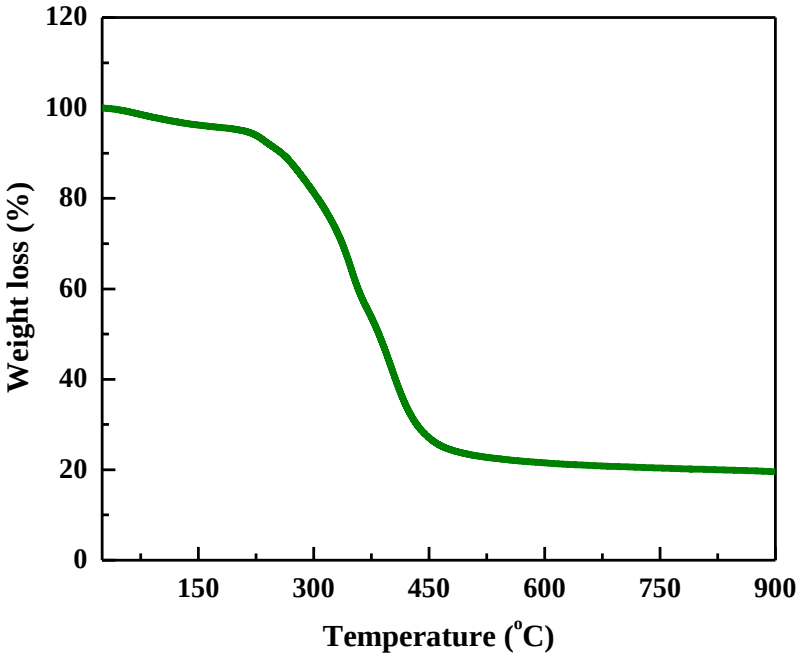

Fig. S1 TGA curve of dried watermelon seed

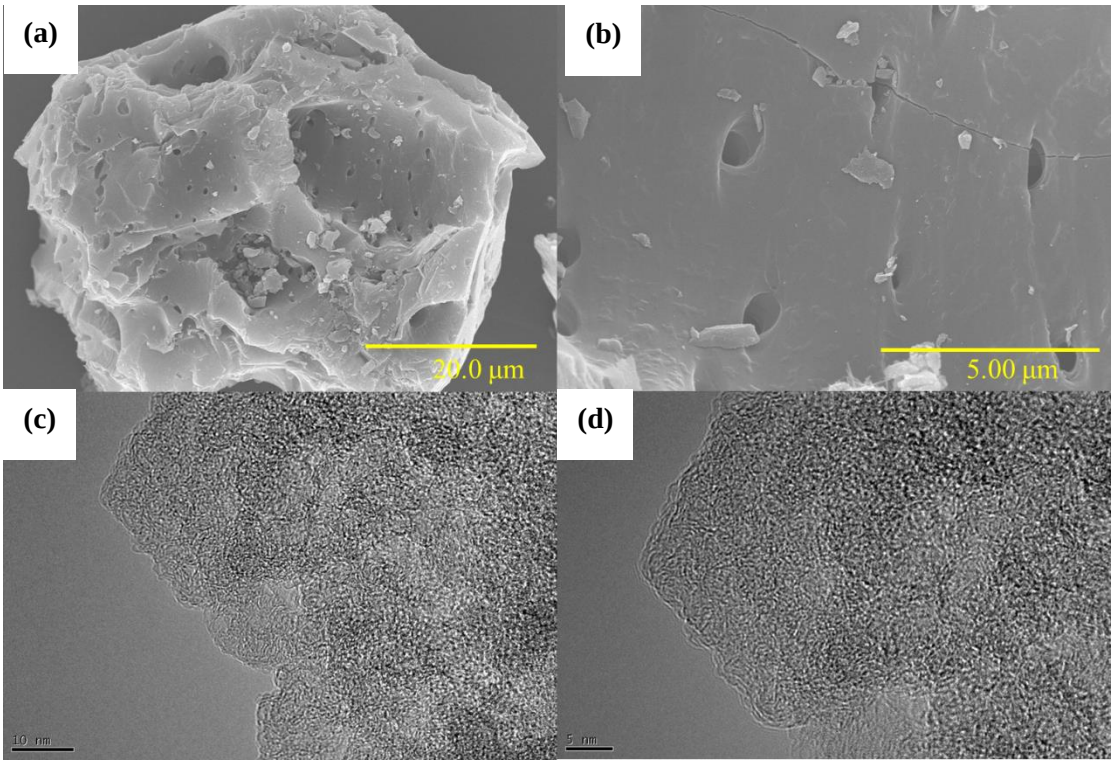

Fig. S2 (a)-(b) FE-SEM images of NS-WDC, and (c)-(d) TEM images of WDC

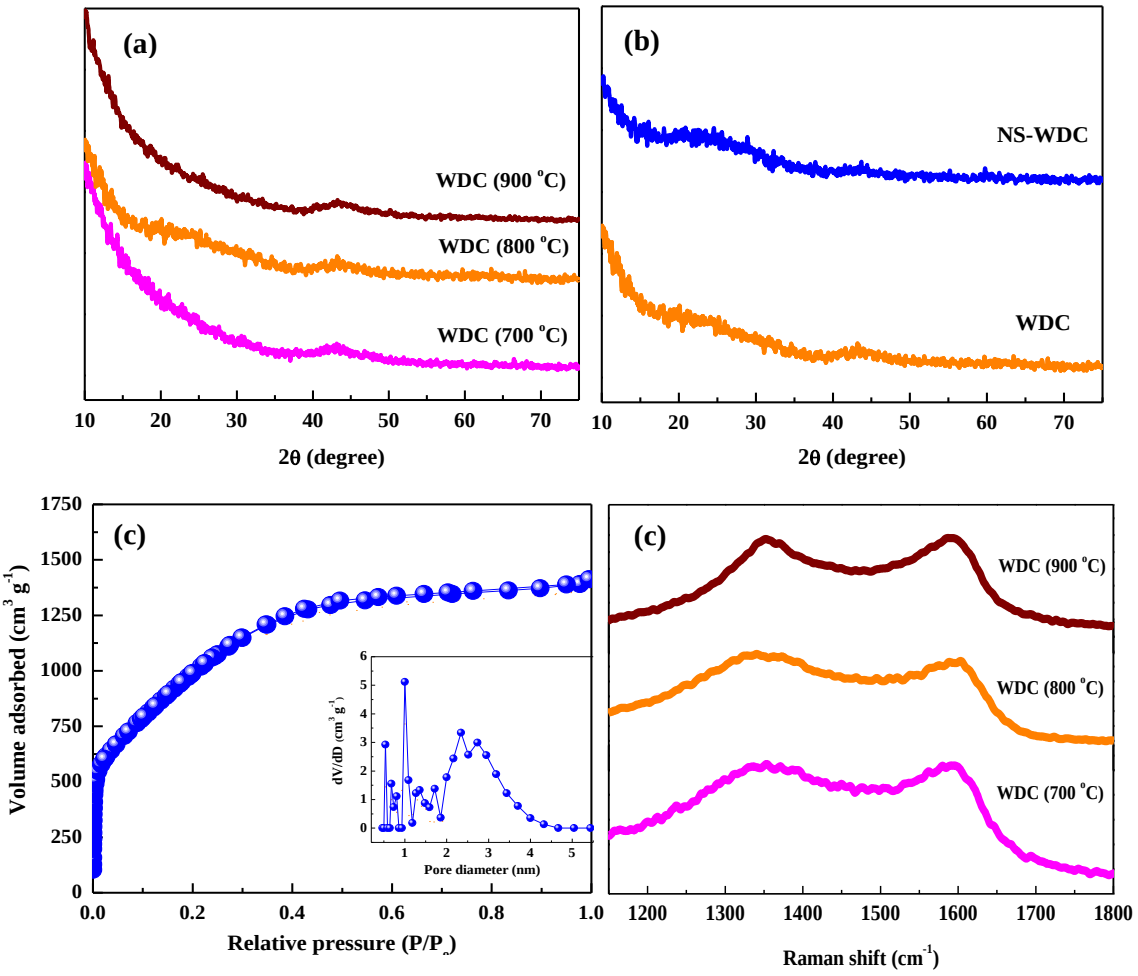

Fig. S3 (a) XRD patterns of WDC obtained at different temperatures, (b) XRD patterns of WDC (800 ^{o}C) and NS-WDC, (c) N_2 adsorption desorption isotherm of NS-WDC, and (d) Raman spectrum of WDC obtained at different temperatures,

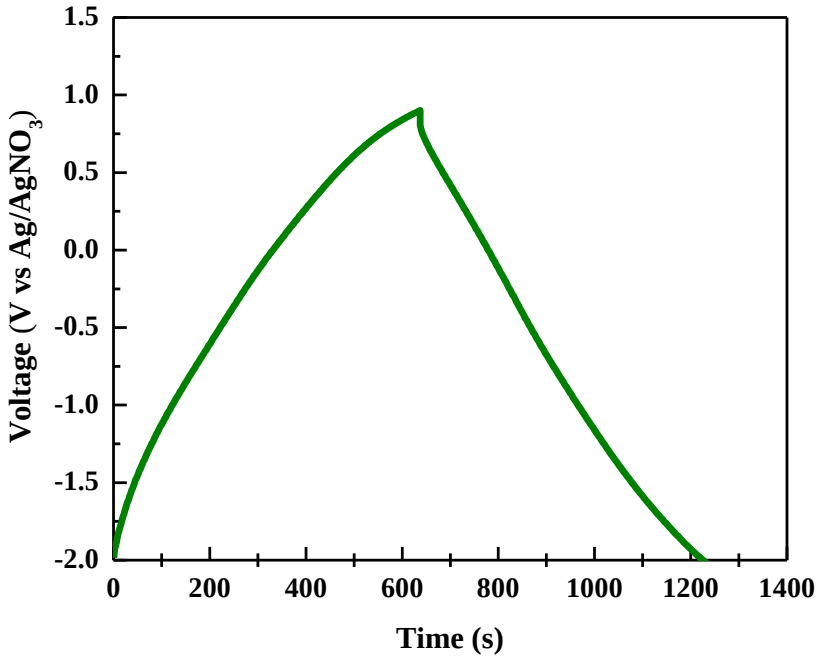

Fig. S4 CD curve of WDC in three electrode configuration at 1 A g^{-1}.

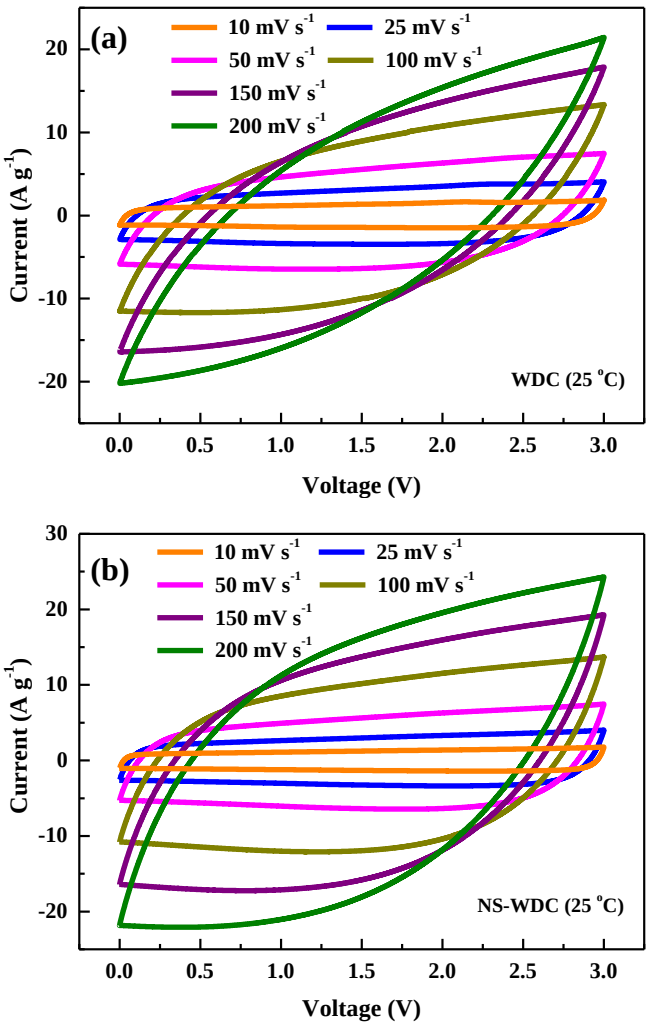

Fig. S5 (a) CV traces of WDCs, (b) CV traces of NS-WDCs

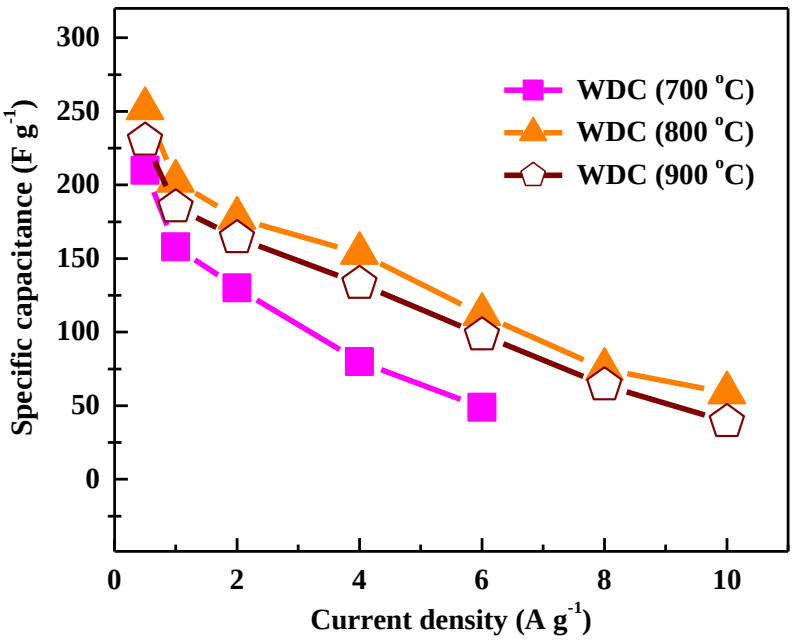

Fig. S6 Rate performance WDCs synthesized at different temperatures

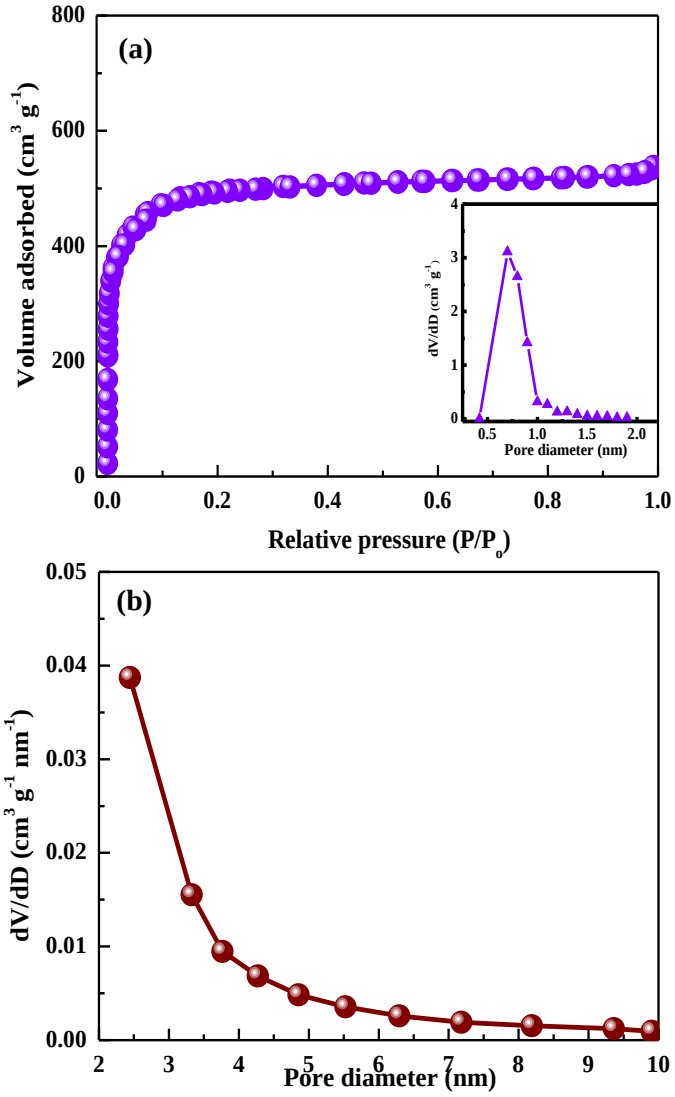

Fig. S8 (a) N_2 adsorption/desorption isotherm of CAC, Inset: Micro Pore size distribution, and (b) BJH pore size distribution

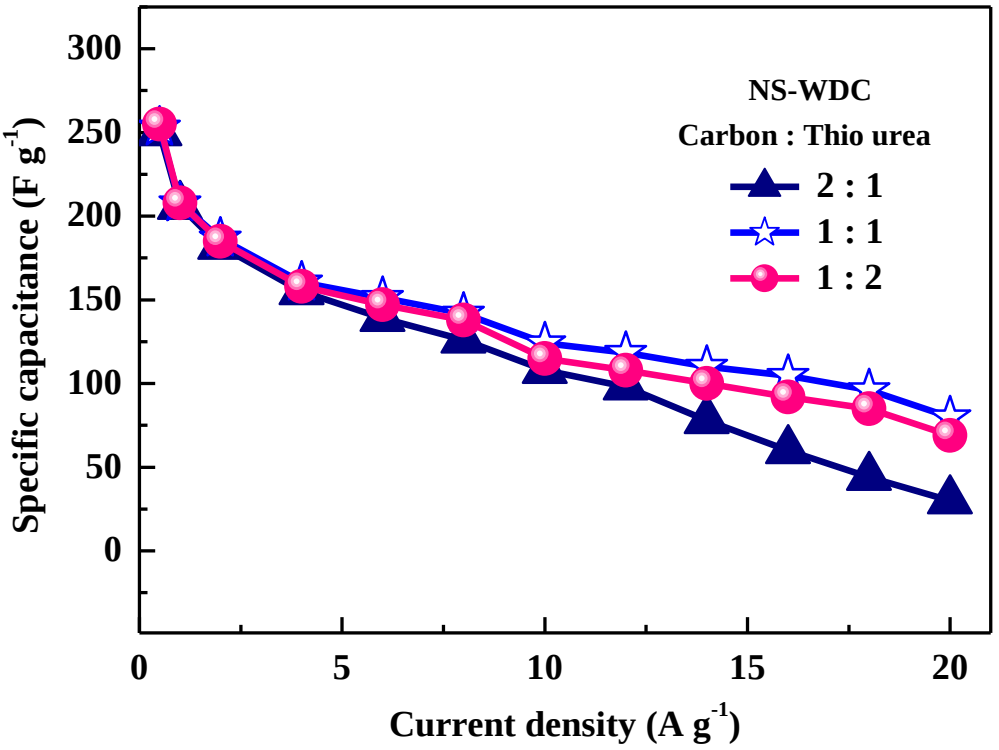

Fig. S8 Effect of porous carbon to thio urea ratio on specific capacitance

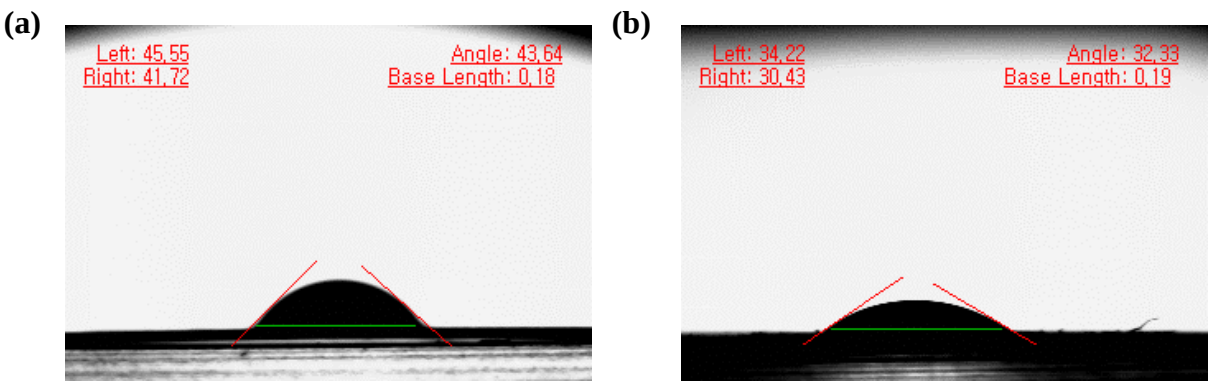

Fig. S9 Contact angle measurements with $NaClO_4$ in EC:DMC

(a) WDC, and (b) NS-WDC electrodes

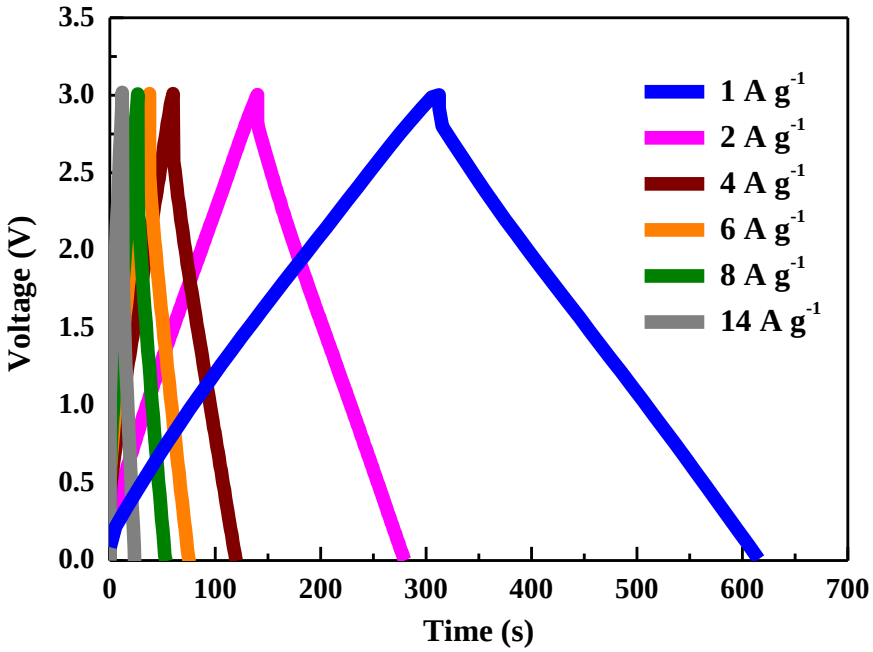

Fig. S10 CD curves of NS-WDC at 55 ^{o}C

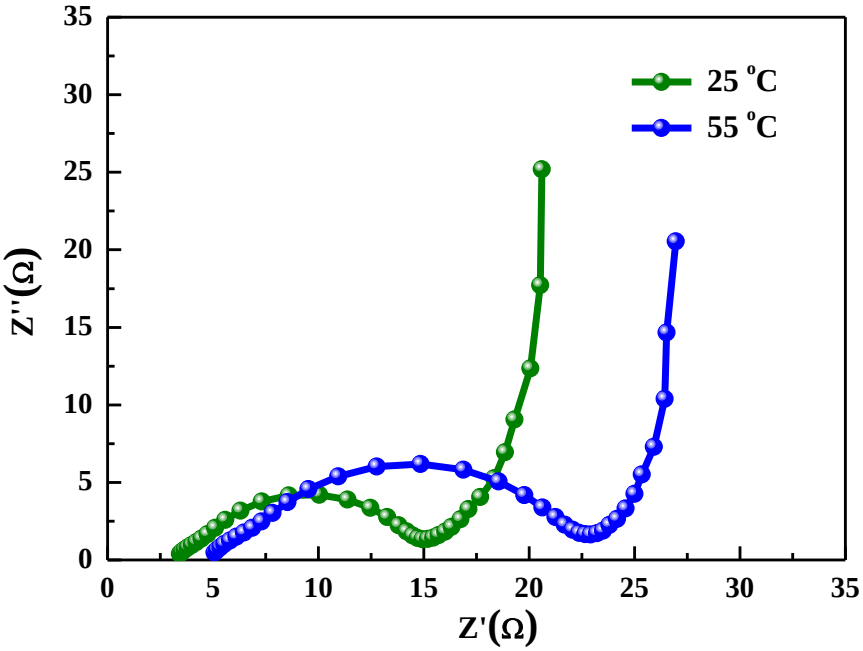

Fig. S12 Nyquist plots of NS-WDC at 25 °C, and 55 °C

Sample	Elemental analysis				
	C (wt%)	O (wt%)	N (wt%)	H (wt%)	S (wt%)
WDC	82.9	13.11	1.85	0.24	0.07
NS-WDC	81.1	10.01	3.59	0.28	3.31

Table S1. Bulk composition of WDC and NS-WDC by elemental analysis

Sample	XPS Analysis			
	C (wt%)	O (wt%)	N (wt%)	S (wt%)
WDC	81.43	15.66	2.9	0.11
NS-WDC	80.49	12.07	4.13	3.31

Table S2. Surface composition of WDC and NS-WDC by XPS

Carbon : Thio urea	Elemental analysis (NS-WDC)				
	C (wt%)	O (wt%)	N (wt%)	H (wt%)	S (wt%)
1 : 0.5	82.1	11.42	2.89	0.25	1.65
1 : 1	81.1	10.01	3.59	0.28	3.31
1 : 2	81.0	9.89	4.46	0.26	2.39

Table S3. Bulk elemental composition of NS-WDC synthesized under different carbon : thio urea ratio