Appendix A.

Supporting Information

Morphology and Oxygen Defects Mediated Improved Pseudocapacitive Li^+ - Storage of Conversion Based Lithium Iron Oxide

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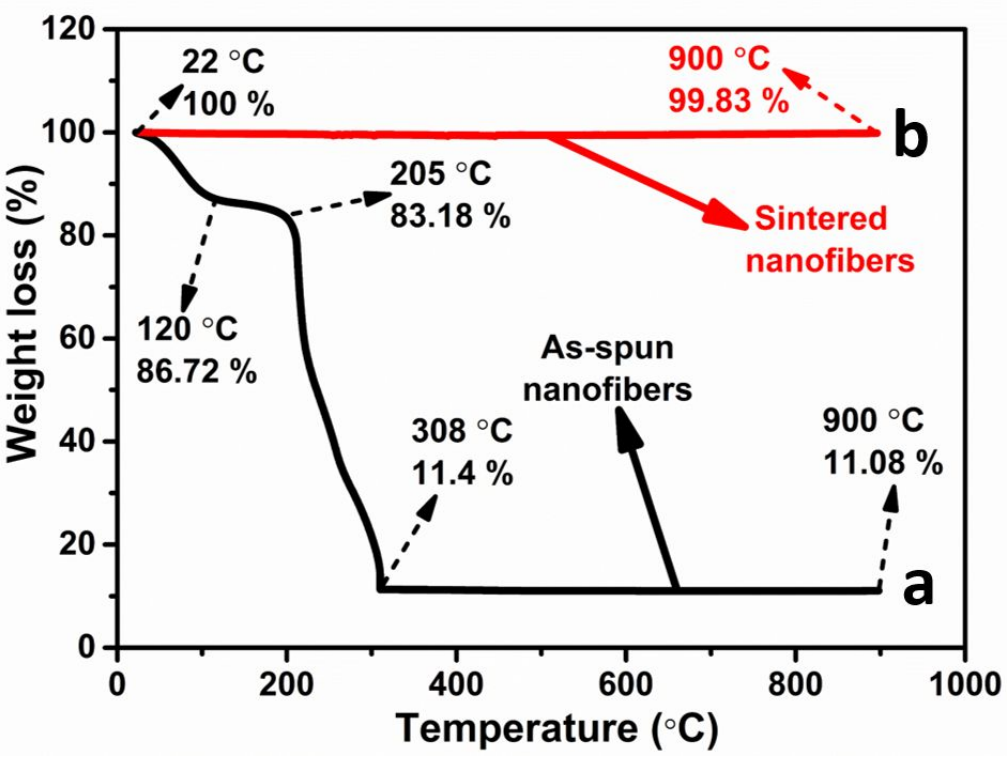

Figure S1. TG curves of **(a)** as-spun and **(b)** calcined LFO nanofibers.

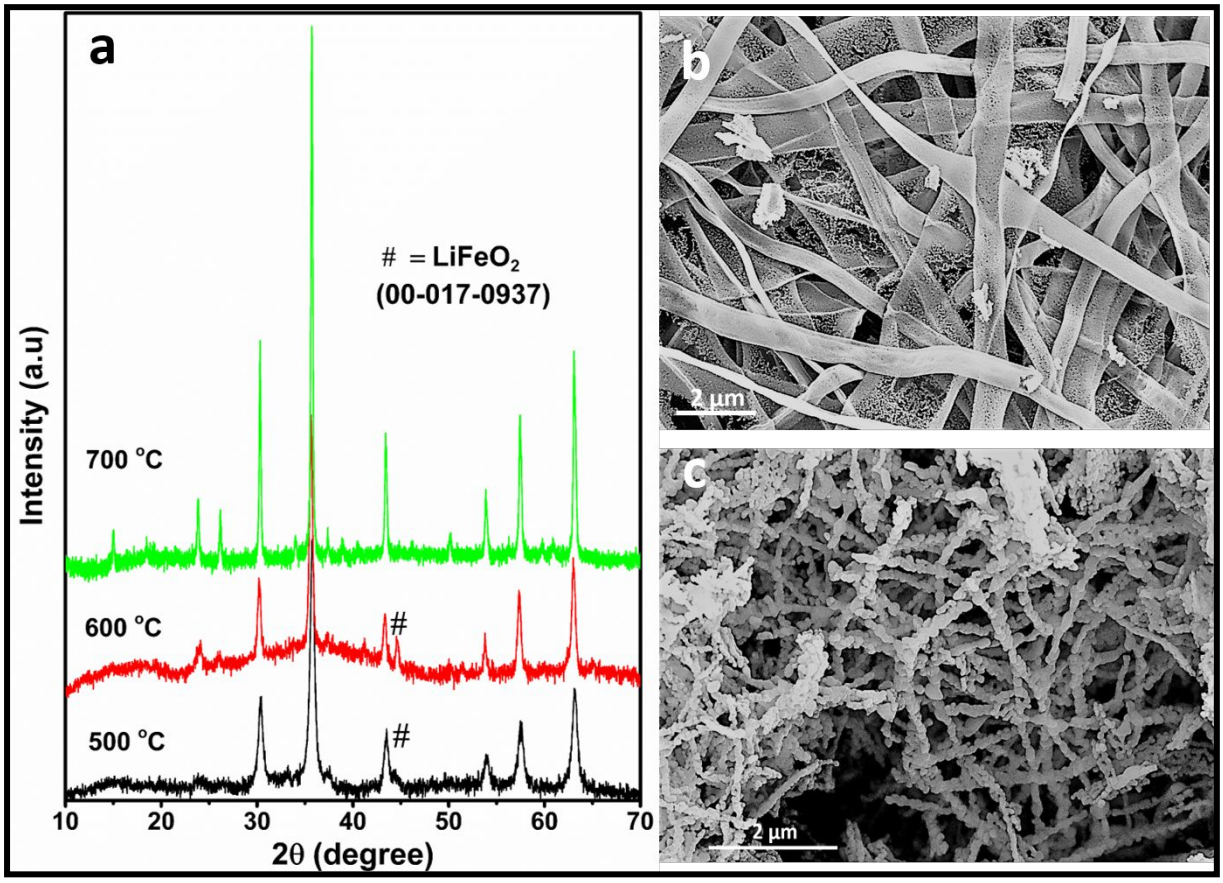

Figure S2. **(a)** XRD pattern of calcined LFO at various temperature at a fixed holding time of 6h. FE-SEM images of LFO sintered at **(b)** 500, and **(c)** 600 ºC for 6h.

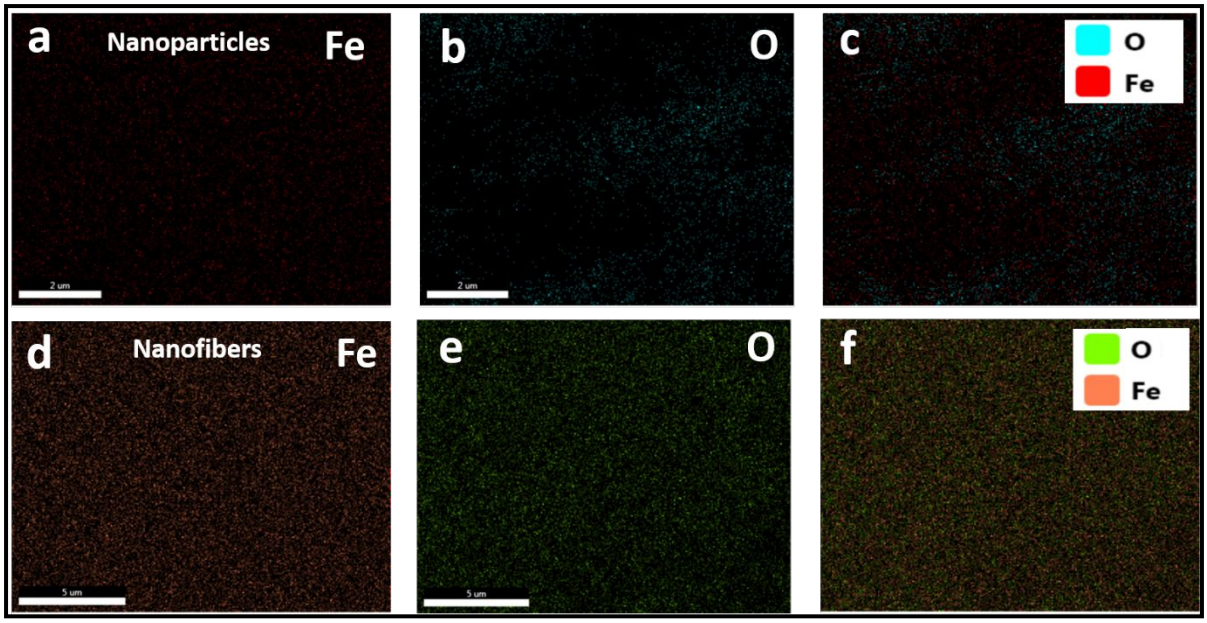

Figure S3. EDX analysis of **(a, b, c)** nanoparticle and **(d, e, f)** nanofibers of LFO.

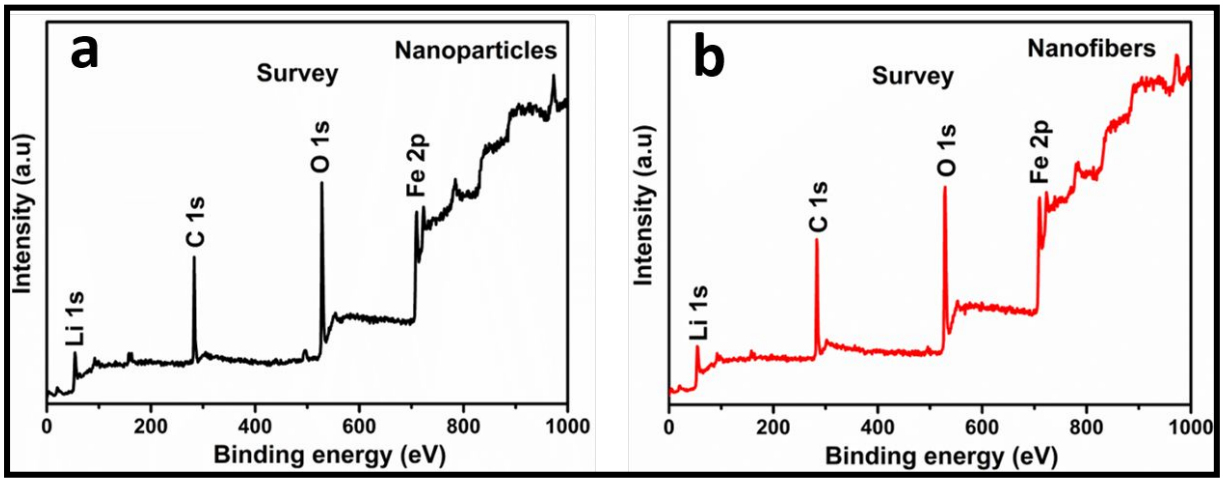

Figure S4. Survey spectra of **(a)** nanoparticles and **(b)** nanofibers of LFO.

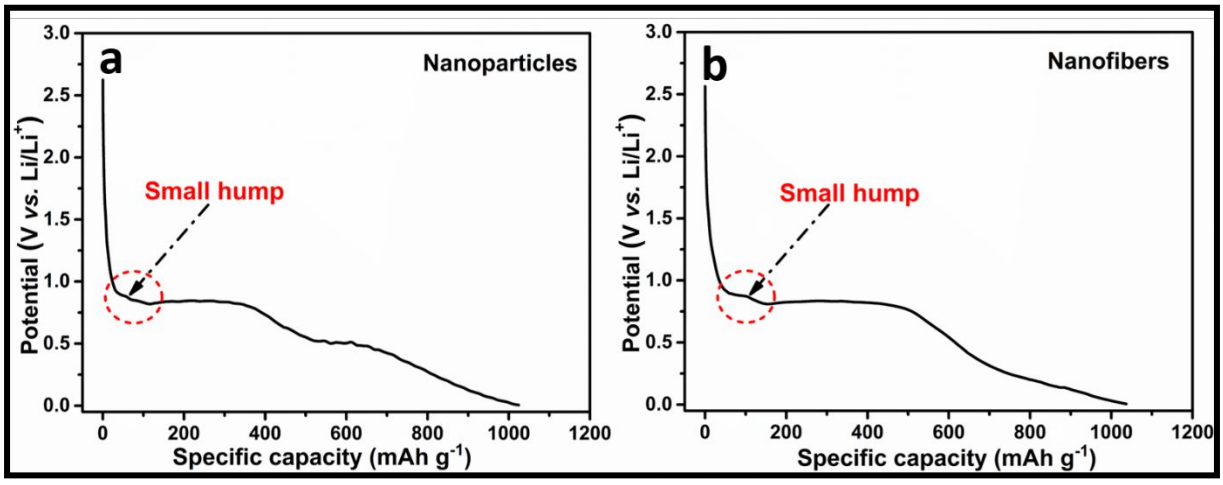

Figure S5. First discharge curve of **(a)** nanoparticles and **(b)** nanofibers of LFO.

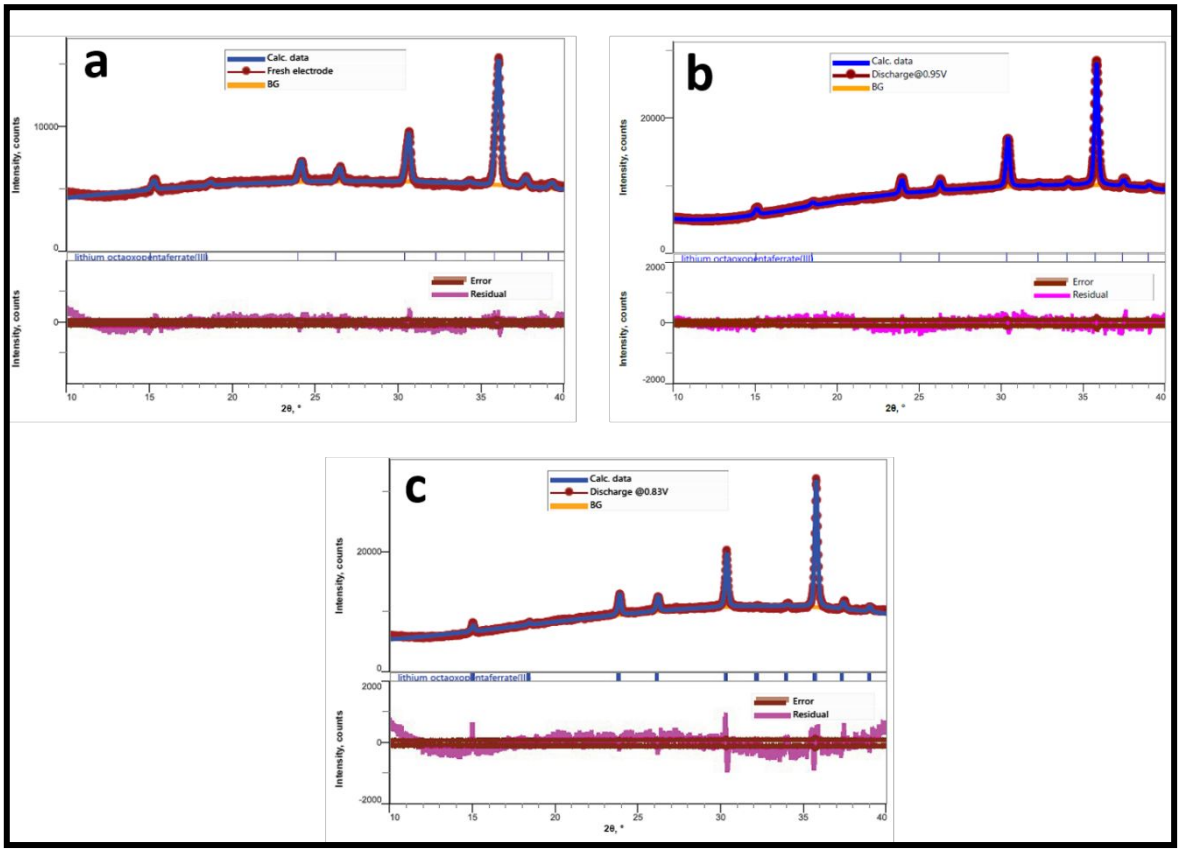

Figure S6. Reitveld refined XRD pattern of various discharge voltage at **(a)** OCV, **(b)** 0.95 V, and **(c)** 0.83 V of LFO electrodes.

Table S1. Refined crystallographic parameters for LFO electrodes at various discharge voltage, using PDF-4-2020:

Discharge Voltage	**R_{wp} (%)**	**R_p (%)**	**S**	**χ^2**	**Lattice parameter (Å) (a=b=c)**
OCV (Fresh electrode)	2.58	2.06	1.93	3.73	8.3110(9)
0.95 V	1.49	1.21	1.39	1.94	8.3292(13)
0.83 V	2.45	1.92	2.39	5.72	8.3361(9)

Table S2. Magnetic parameters (M-H) of LFO electrode at various 1st discharge/charge cycle.

Voltage (V)	M_s (emu g^{-1})	M_r (emu g^{-1})	H_c (Oe)
OCV	35.74	7.70	136
Discharge@0.95 V	32.10	6.65	131
0.85 V	30.82	6.25	130
0.75 V	10.55	0.44	63
0.005 V	7.24	0.28	62
Charge @2 V	8.31	0.35	68
3 V	13.71	0.36	47

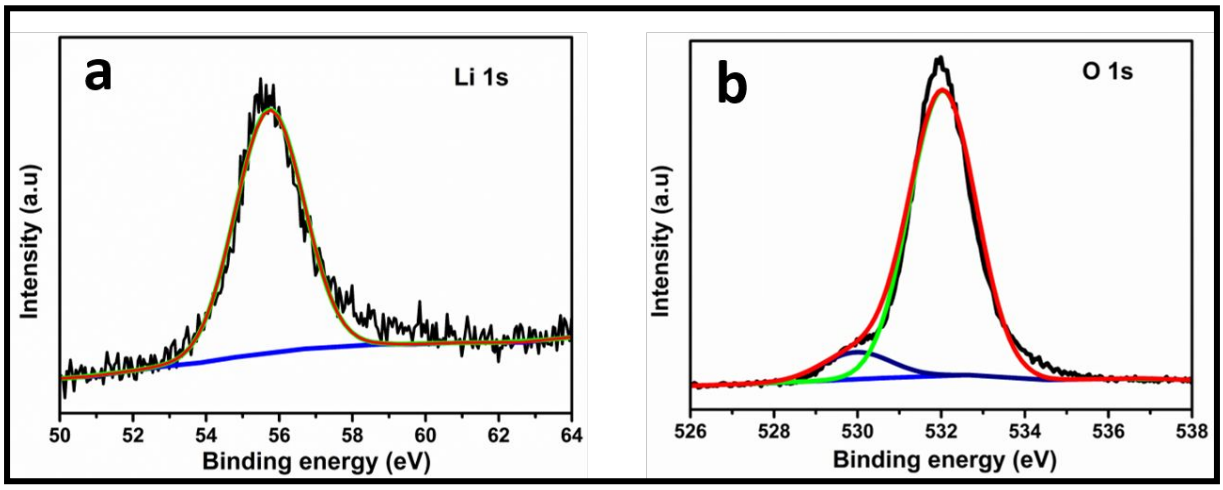

Figure S7. Ex-situ XPS **(a)** Li 1s, and **(b)** O1s of LFO electrodes at charge state (3 V).

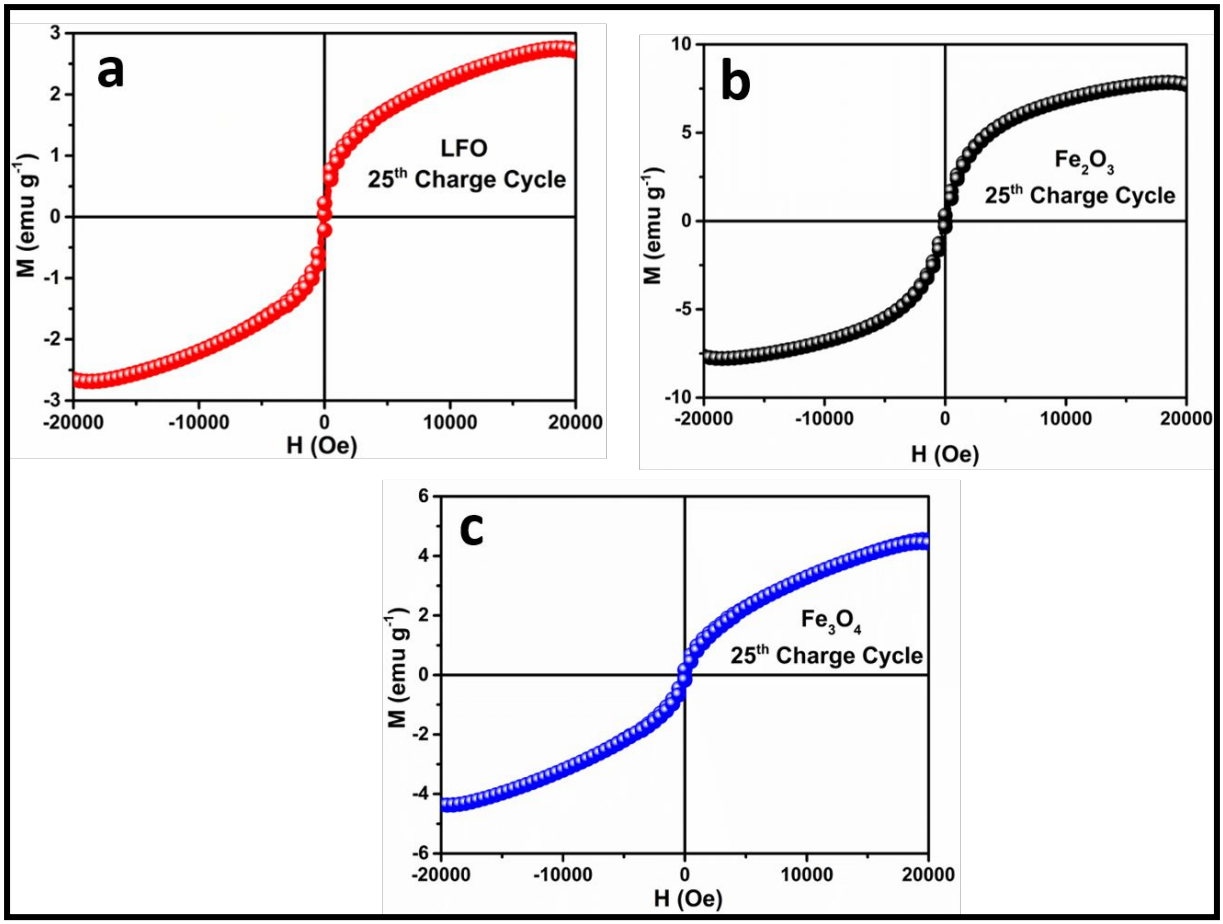

Figure S8. Ex-situ M-H curves **(a)** LFO, **(b)** Fe_2O_3, and Fe_3O_4 electrodes at 25th charge state (3 V).

Table S3. Magnetic parameters (M-H) of LFO, Fe_2O_3, and Fe_3O_4 electrode at 25th charge cycle.

Electrode Material	**M_s (emu g^{-1})**	**M_r (emu g^{-1})**	**H_c (Oe)**
LFO	2.77	0.23	132
Fe_2O_3	7.88	0.32	102
Fe_3O_4	4.51	0.16	131

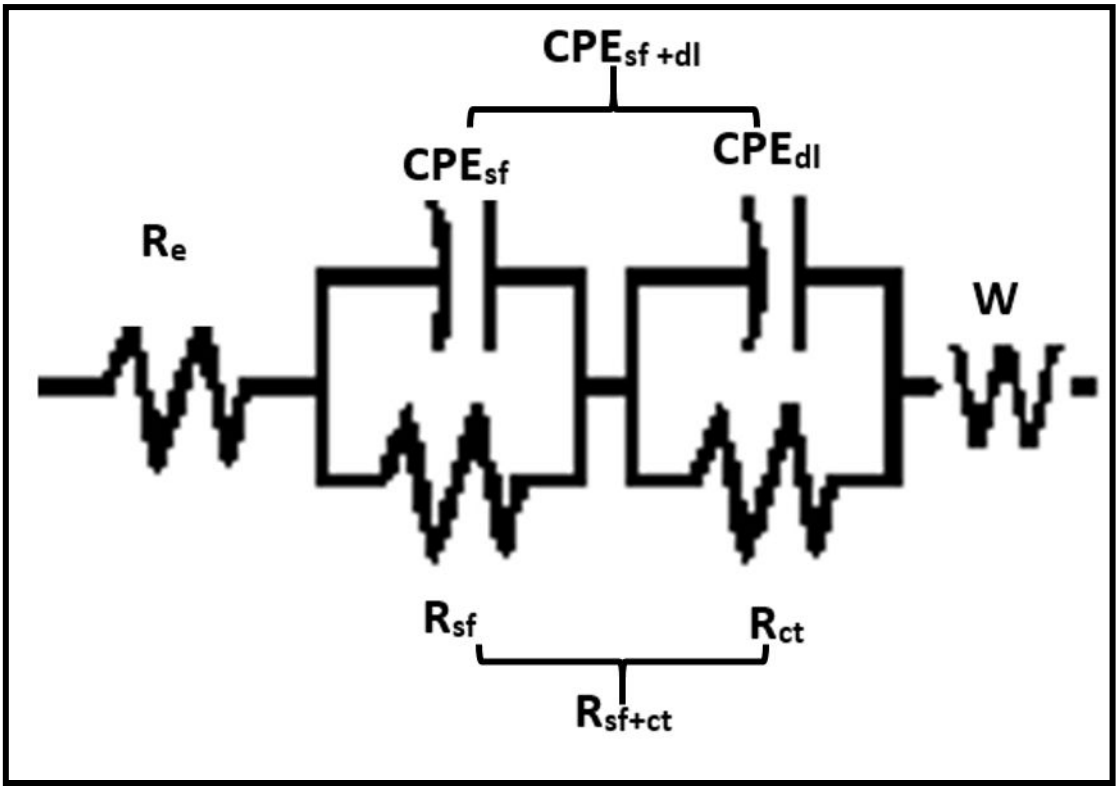

Figure S9. Equivalent circuit used for fitting the impedance spectra

Table S4: EIS parameters of fresh and cycled (60^{th}) electrode of nanoparticle and nanofibers.

Electrode	R_e (Ω) (±1)	R_{sf+ct} (Ω) (±5)	CPE_{sf+dl} (S sec^n) × 10^{-5}	n (0.02)	Diffusion coefficient (cm^2 s^{-1})
Fresh nanoparticles	4.6	127	3.98	0.76	5.92×10^{-14}
Fresh nanofibers	4.6	54	6.09	0.76	4.72×10^{-14}
Cycled (60^{th}) nanoparticles	4.6	68	2.01	0.79	4.43×10^{-17}
Cycled (60^{th}) nanofibers	4.6	36	5.84	0.85	2.50×10^{-14}

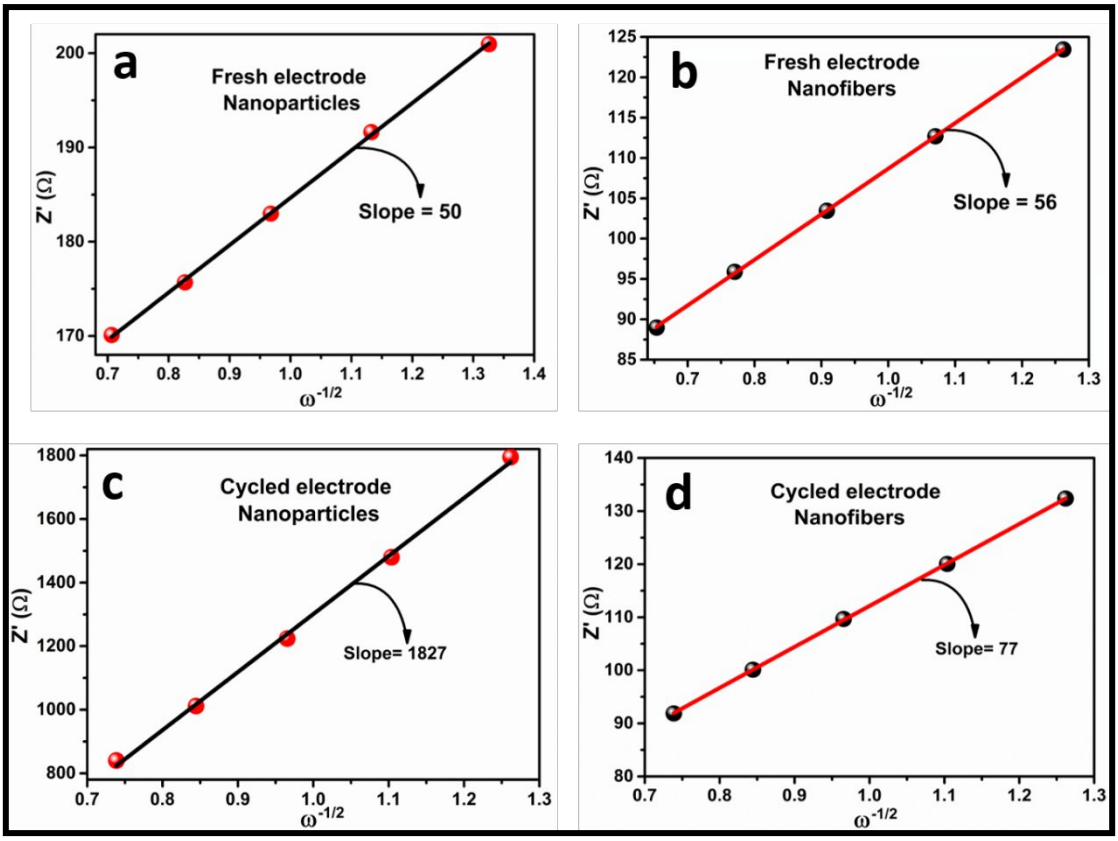

Figure S10. $Z^{'}$ vs. $\omega^{-1/2}$ curve of fresh electrode of **(a)** nanoparticles, **(b)** nanofibers and cycled electrode of **(c)** nanoparticles, **(d)** nanofibers.