Supporting Information

Uniform spheroidal nanoassemblies of magnetite using Tween surfactants: Influence of surfactant structure on morphology and electrochemical performance

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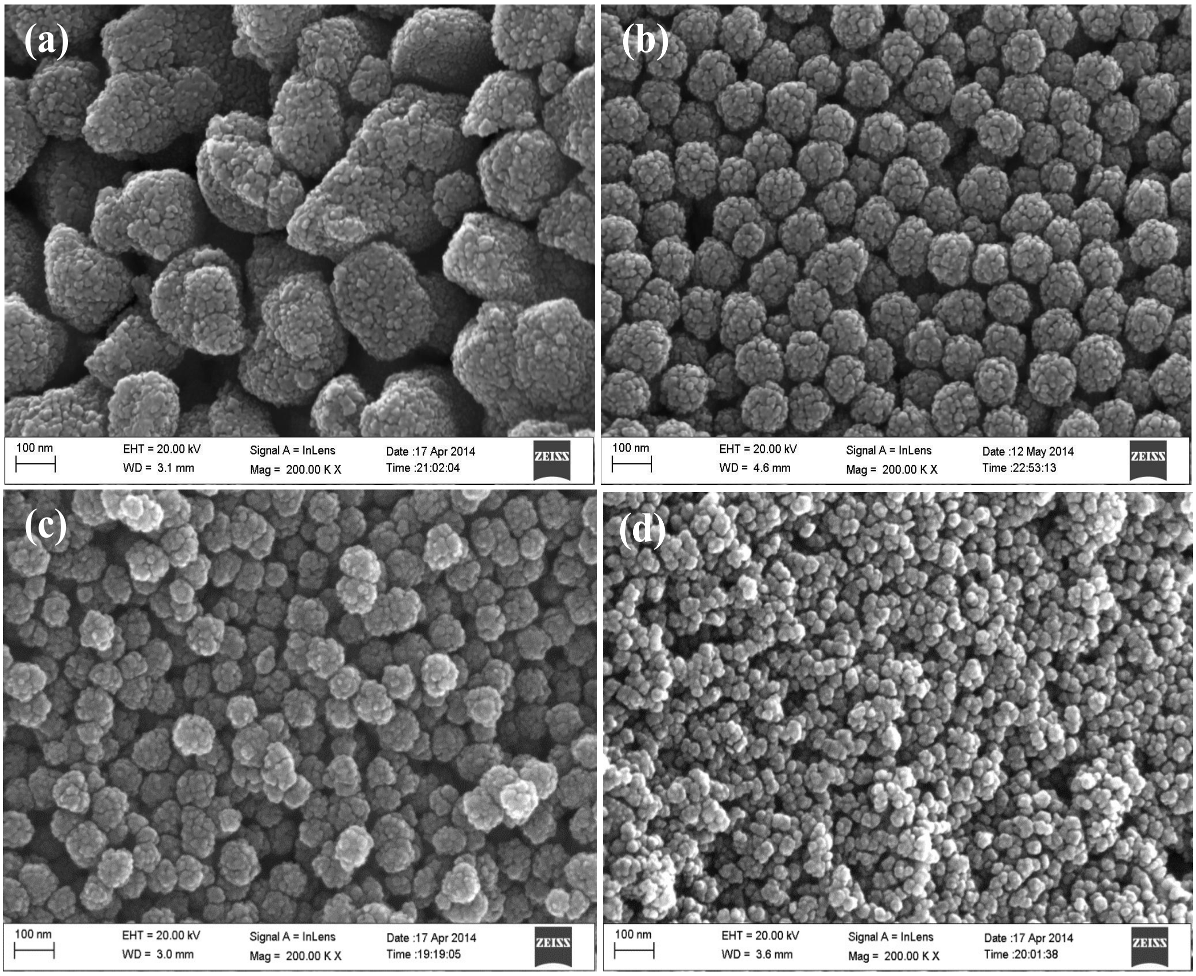

Figure S1. SEM images showing effect of water added externally during synthesis of SMNAs using Tween 80 as surfactant. Assemblies obtained when (a) 0 μL (**T80-0**), (b) 100 μL (**T80-100**), (c) 200 μL (**T80-200**) and (d) 500 μL (**T80-500**) distilled water was added during synthesis.

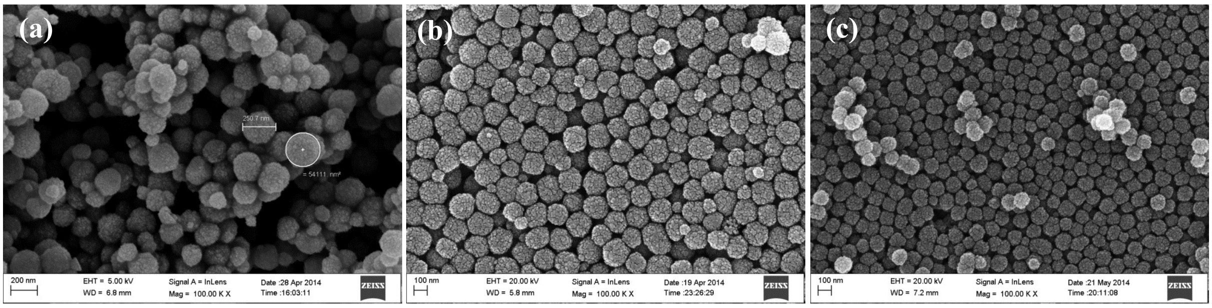

Figure S2. SEM images showing effect of water added externally during synthesis of SMNAs using Tween 20 as surfactant. Assemblies obtained when (a) 50 µL (**T20-50**) (b) 100 µL (**T20-100**), and (c) 200 µL (**T20-200**) distilled water was added during synthesis.

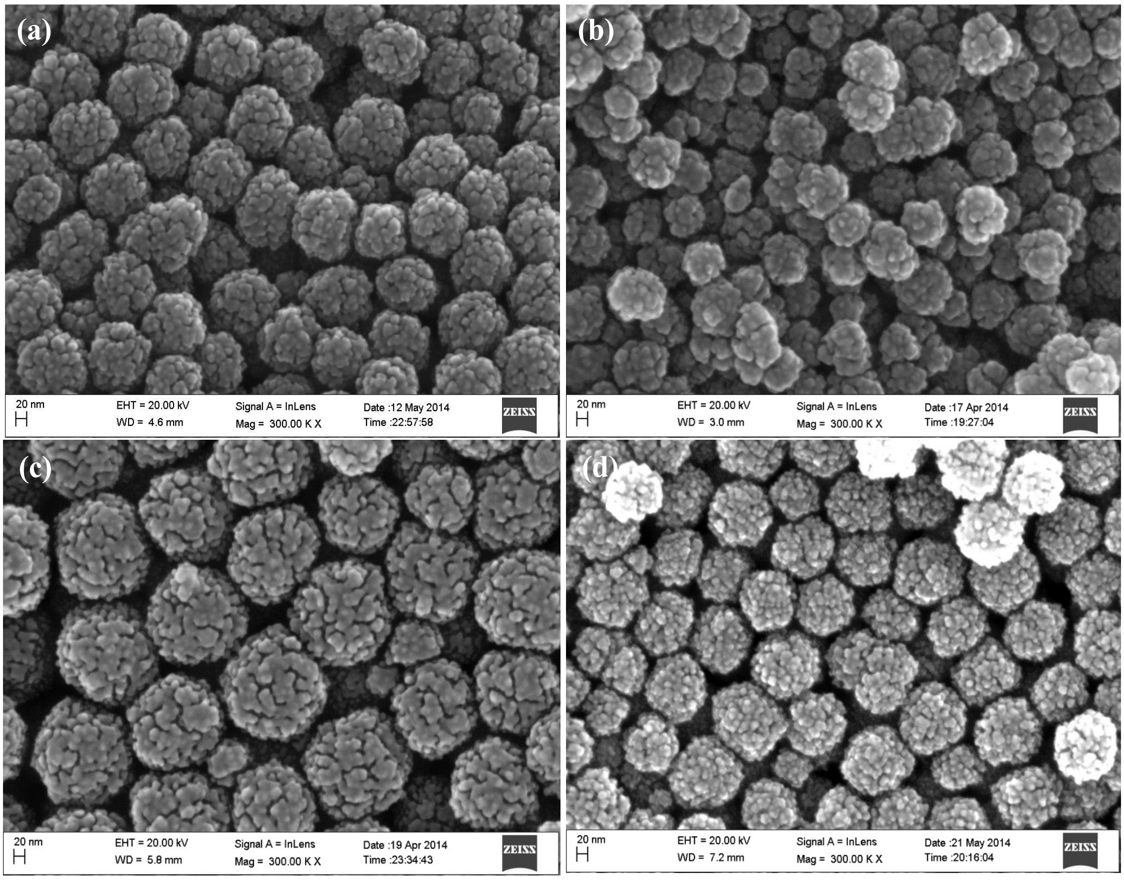

Figure S3. High magnification (300 kx) SEM images of (a) **T80-100**, (b) **T80-200**, (c) **T20-100**, and (d) **T20-200** showing uniform spherical nanoassemblies that are in turn composed of smaller constituent nanoparticles.

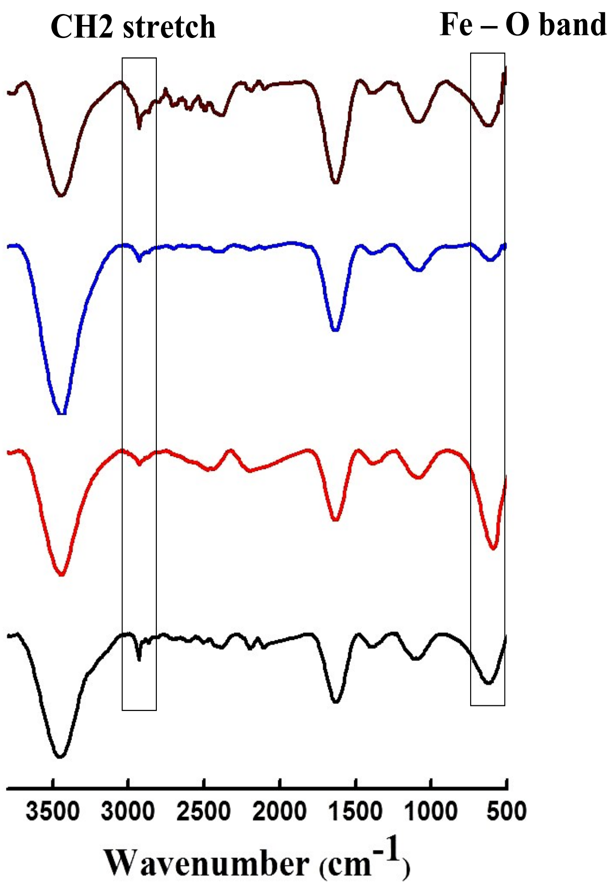

Figure S4. FT-IR spectra of SMNAs. **T80-0** (black), **T80-100** (red), **T80-200** (blue), and **T80-500** (wine). The Fe-O and C-H stretch bands are highlighted in the figure.

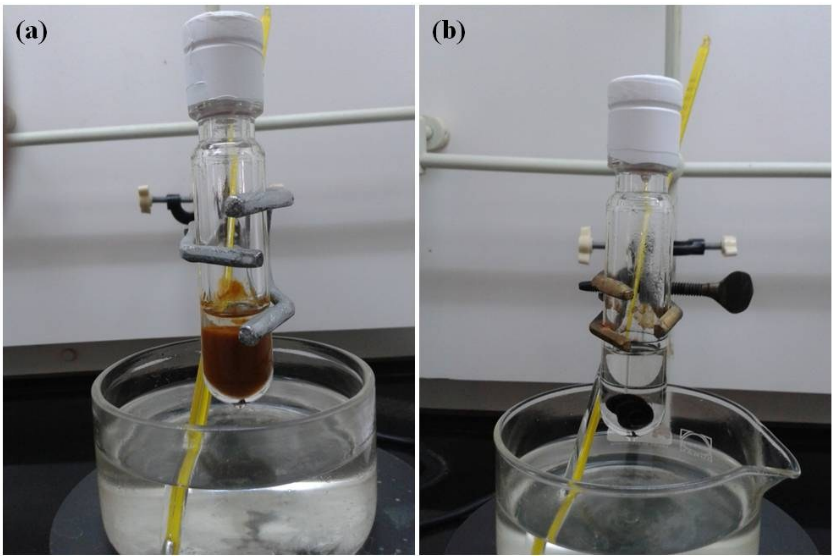

Figure S5. Digital photographs of the samples heated at (a) 150 ºC, and (b) 200 ºC for 11 h. Only the sample heated at 200 ºC resulted in the formation of black magnetic product.

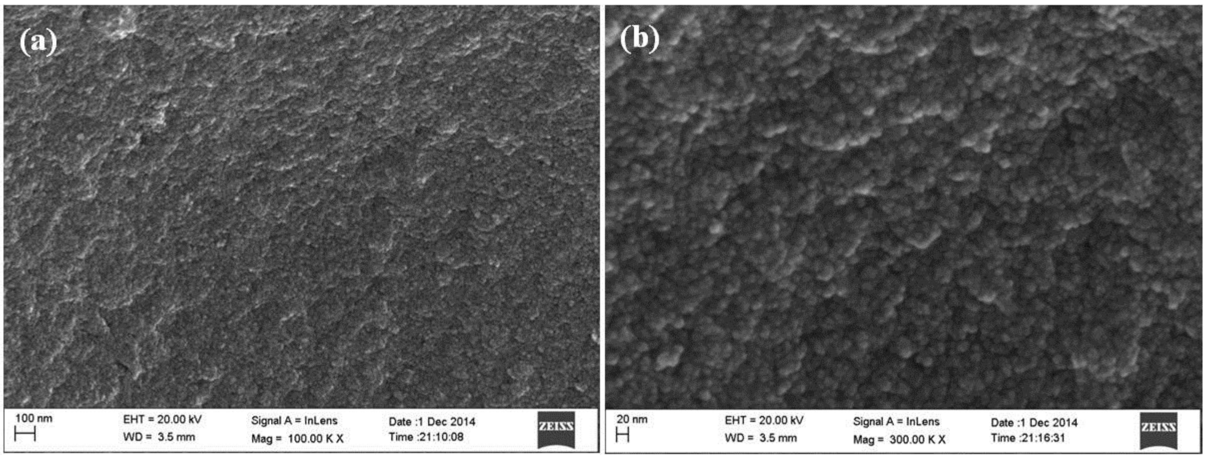

Figure S6. SEM images of the sample at 100 and 300 kx obtained at 150 ºC after 11 h of heating. This reaction didn't form magnetic product. Instead a deep-yellow suspension was obtained.

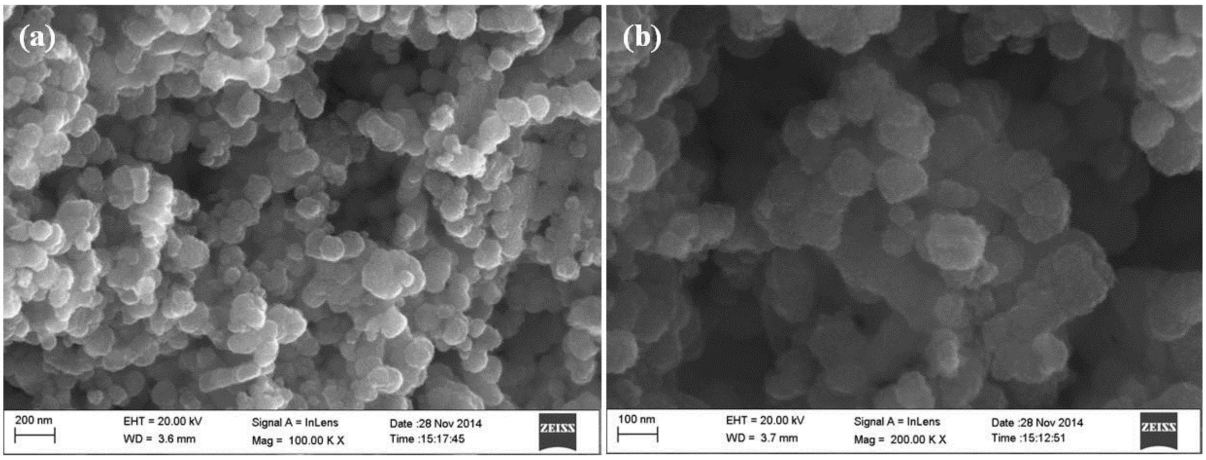

Figure S7. SEM images at 100 and 200 kx of the sample when Ferric acetate was used instead of Ferric chloride. Note that it resulted in the formation of polydisperse nanoaggregates.

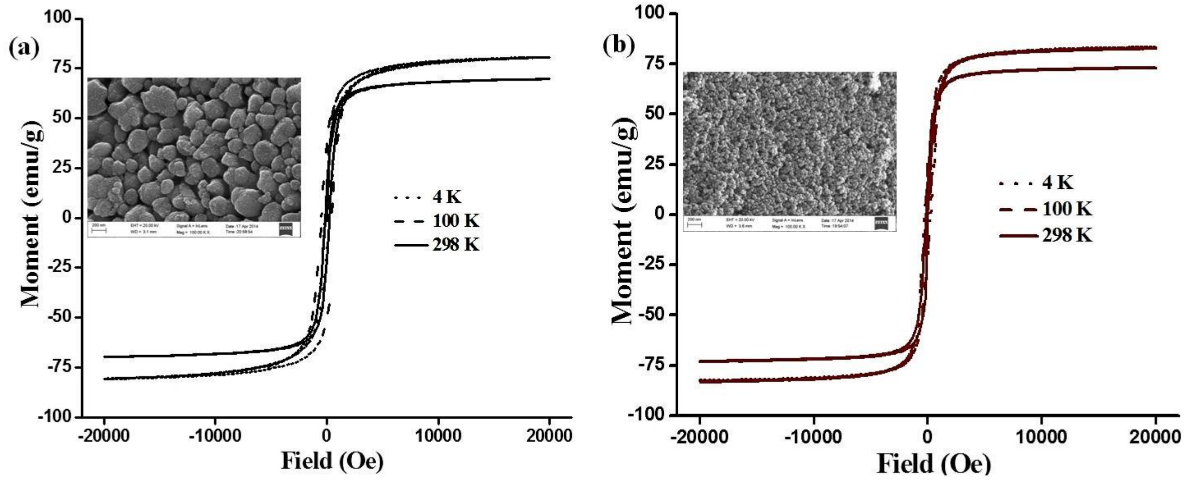

Figure S8. M-H curves at 4, 100, and 298 K for (a) **T80-0**, and (b) **T80-500**.

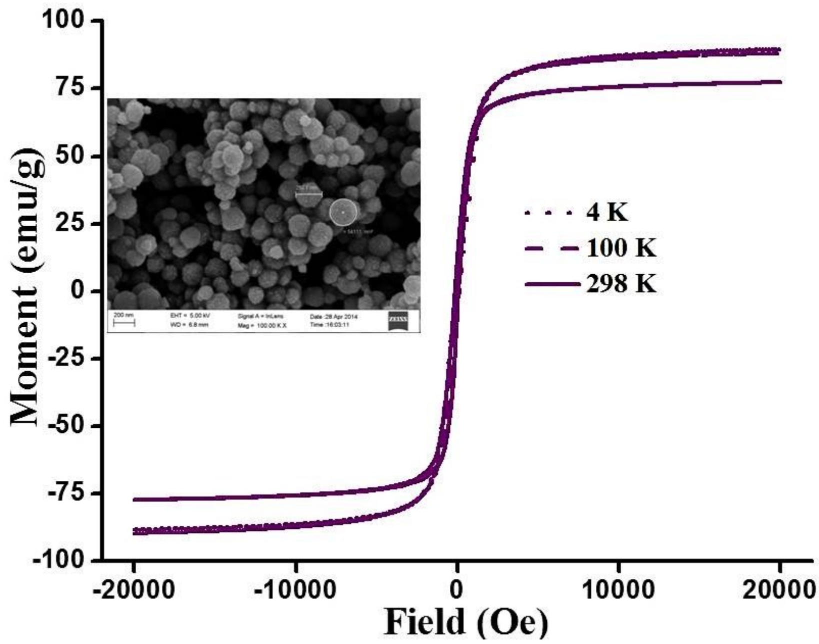

Figure S9. M-H curves of **T20-50** SMNAs at 4, 100, and 298 K.

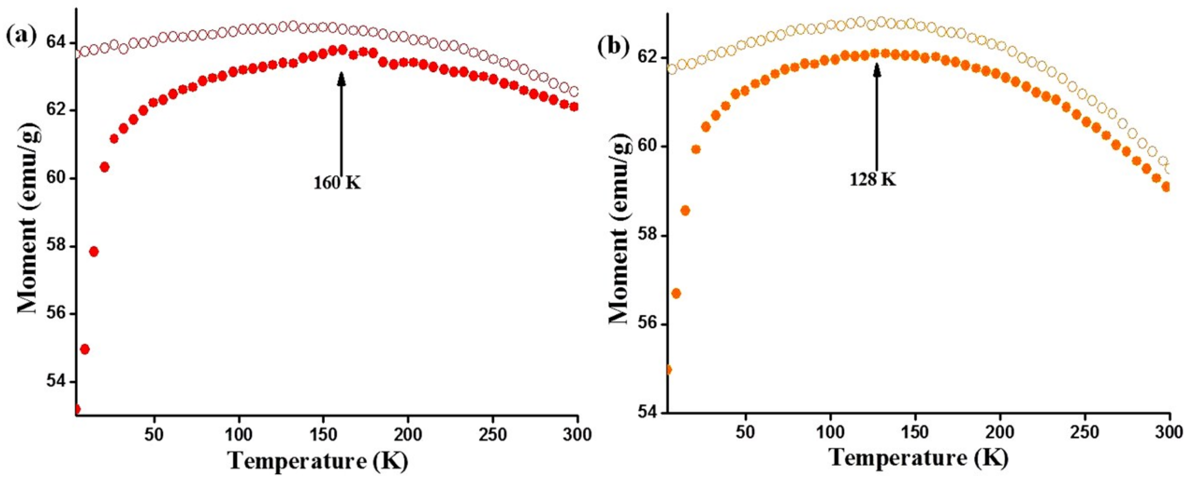

Figure S10. ZFC (filled circles) and FC (empty circles) curves for (a) **T80-100**, and (b) **T20-200** SMNAs.

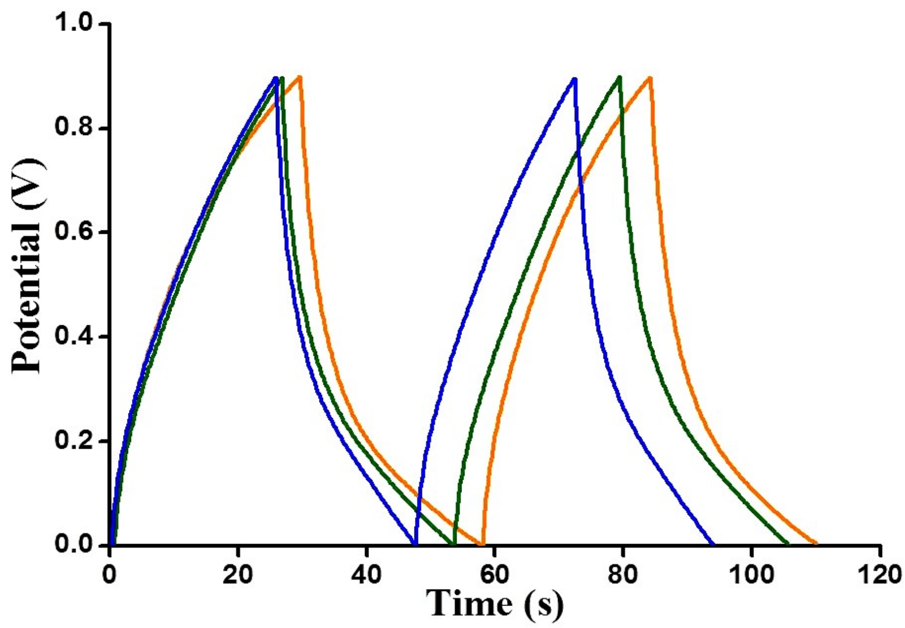

Figure S11. Galvanostatic charge/discharge curves for **T20-200** (orange), **T20-100** (green), and **T80-200** (blue) at a current density of 1 A/g.

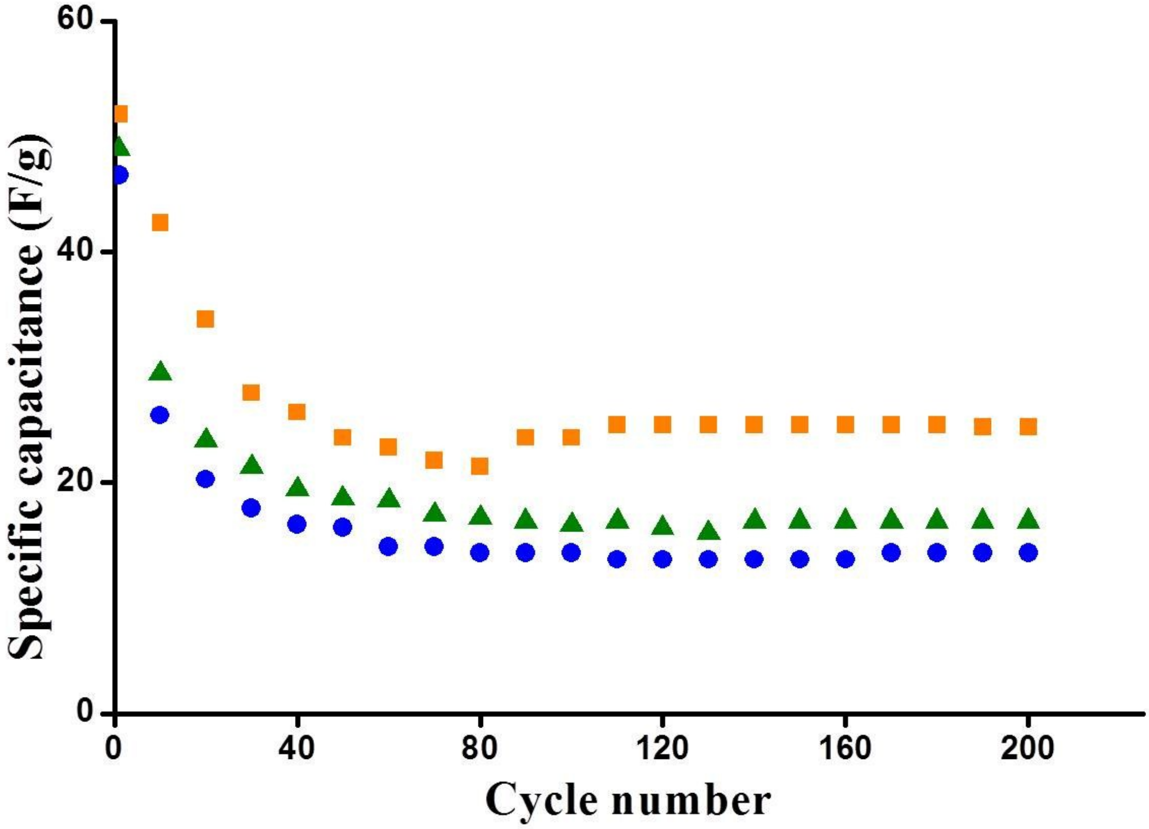

Figure S12. Long-term cyclic stability at a current density of 0.5 A/g in galvanostatic charge/discharge. Colour codes for the samples are **T20-200** (Orange), **T20-100** (Green) and **T80-200** (blue).

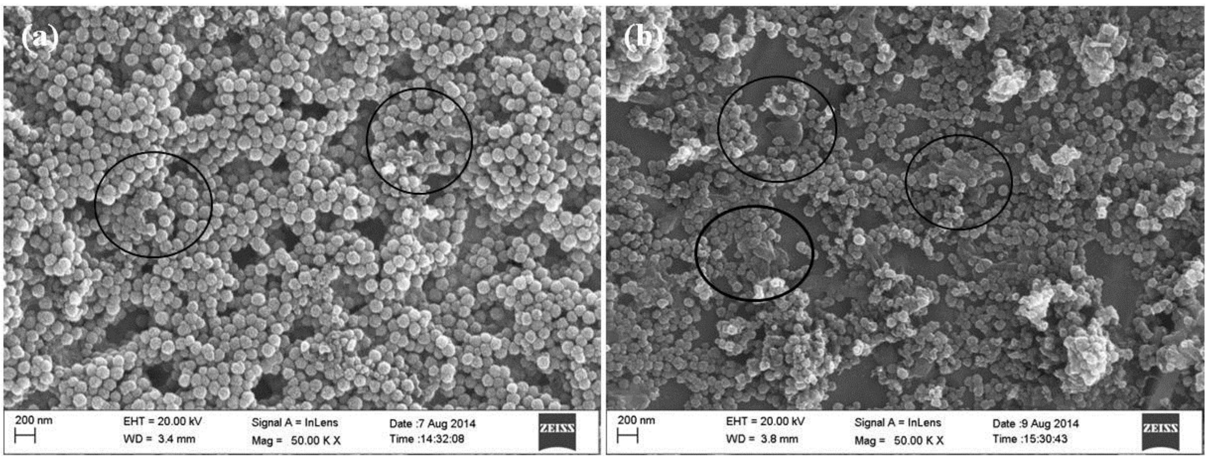

Figure S13. Low magnification (50 kx) SEM images for samples T20-200 and T80-200 coated on Pt electrode. Encircled regions show the presence of acetylene black at these magnifications.

Table S1. Saturation magnetization (M_s) values for various magnetite samples obtained for M-H curves at 4, 100 and 298 K.

Sample	M_s (emu/g)		
	4 K	100 K	298 K
T80-0	80.6	80.0	69.7
T80-100	90.8	89.3	79.4
T80-200	95.0	94.1	83.3
T80-500	83.2	82.6	73.0
T20-50	89.5	88.1	77.3
T20-100	87.6	86.6	74.4
T20-200	86.6	85.4	73.3

Table S2. Specific capacitances of **T20-200**, **T80-200** and **T20-100** at different scan rates of cyclic voltammetry and current densities of galvanostatic charge/discharge.

Sample	Scan rate (mV/s)	Specific capacitance (F/g)	Current density (A/g)	Specific capacitance (F/g)
T20-200	2	76	0.5	48
	5	54	0.8	35
	10	48	1	33
	20	23	2	19
T80-200	2	64	0.5	31
	5	52	0.8	29
	10	43	1	27
	20	21	2	22
T20-100	2	62	0.5	41
	5	58	0.8	31
	10	44	1	29
	20	22	2	23

Example showing calculation of mean crystal domain size using Scherrer equation:

$$t = 0.9\lambda/B\cos\theta$$

where t = linear dimension of the particle or mean crystal domain size;

λ = wavelength of incident X-rays and is equal to 0.154nm for Cu Kα radiation;

B = line broadening at half the maximum intensity in radians often called full width at half maximum (FWHM);

θ = Bragg angle.

The typical value of 0.9 of numerical constant often called as shape factor has been used here to carry out calculations.

Mean crystal domain size determination for T80-100:

B or FWHM = 0.440 ° = 0.007678 rad;

2θ = 35.4 ° or θ = 17.7 ° so that $\cos\theta$ = 0.95;

Hence, t = 0.9 * 0.154/0.007678 * 0.95 = **18.9 nm**