Electronic Supplementary Material (ESI) for Polymer Chemistry.

SUPPORTING INFORMATION

Nano-structured magneto-responsive membranes from block copolymer aggregates and functionalized iron oxide nanoparticles

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Table S1: Particle diameter measured using dynamic light scattering.

Volume of bad solvent added (mL)	Hydrodynamic diameter (nm) (By number average and not by intensity or volume)	PDI from DLS
Water pH 7		
0.1	102.0	0.19
0.2	142.3	0.22
0.3	158.5	0.28
0.4	161.7	0.36
0.5	165.3	0.41
0.6	169.5	0.42
0.7	171.1	0.45
0.8	182.9	0.41
0.9	184.3	0.42
$PMAA_{47}$ coated particles		
0.1	96.3	0.12
0.2	99.3	0.18
0.3	111.3	0.31
0.4	123.4	0.26
0.5	138.9	0.21
0.6	148.9	0.28
0.7	151.3	0.31
0.8	162.3	0.38
0.9	189.3	0.41
$PMAA_{47}$-$PQDMAEMA_{50}$ coated particles		
0.1	78.3	0.11

0.2	123.3	0.24
0.3	167.6	0.28
0.4	183.4	0.18
0.5	198.9	0.38
0.6	228.6	0.31
0.7	241.8	0.38
0.8	268.9	0.37
0.9	321.6	0.31
DMSA coated particles		
0.1	122.3	0.26
0.2	189.6	0.22
0.3	228.9	0.32
0.4	238.5	0.28
0.5	289.6	0.41
0.6	341.3	0.42
0.7	328.9	0.39
0.8	358.6	0.45
0.9	371.3	0.36

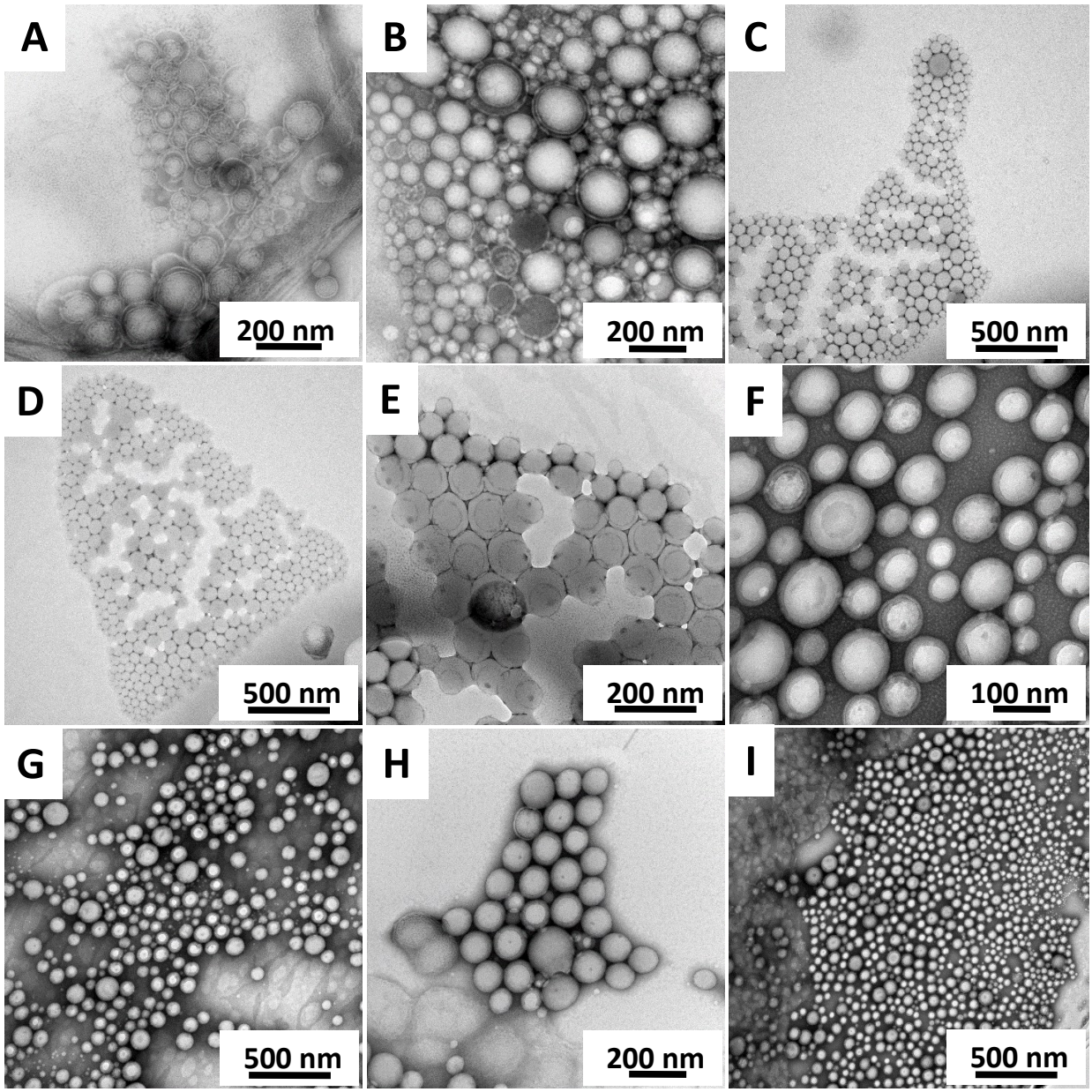
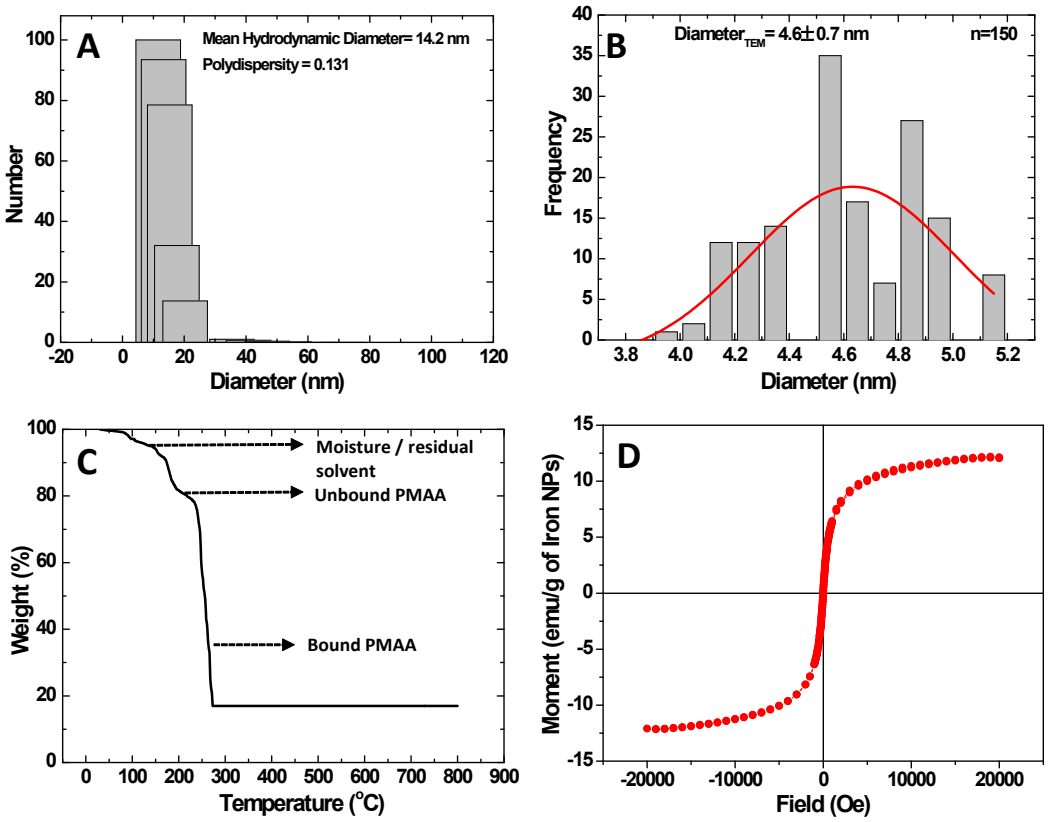


Figure S1. TEM images of nanoparticles prepared from addition of (A) 0.1 mL (B) 0.2 mL (C) 0.3 mL (D) 0.4 mL (E) 0.5 mL (F) 0.6 mL (G) 0.7 mL (H) 0.8 mL (I) 0.9 of water to 1 mL of $PMAA_{47}$-*b*-$PMMA_{69}$ solution in THF at 20 w/w %.



PMAA composition	78.2%	Saturation Magnetisation, Ms	12.7 emu/g
Iron Nps composition	21.8%	Coercivity, Hc	3.1 Oe

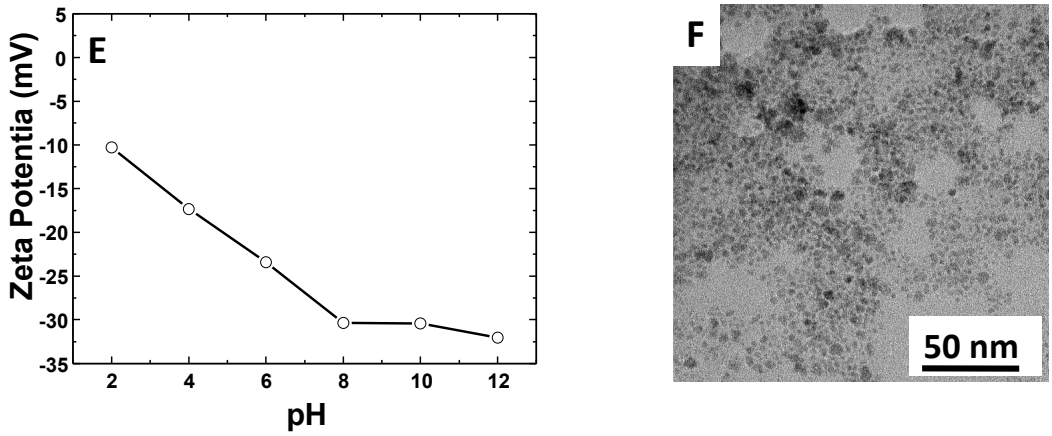
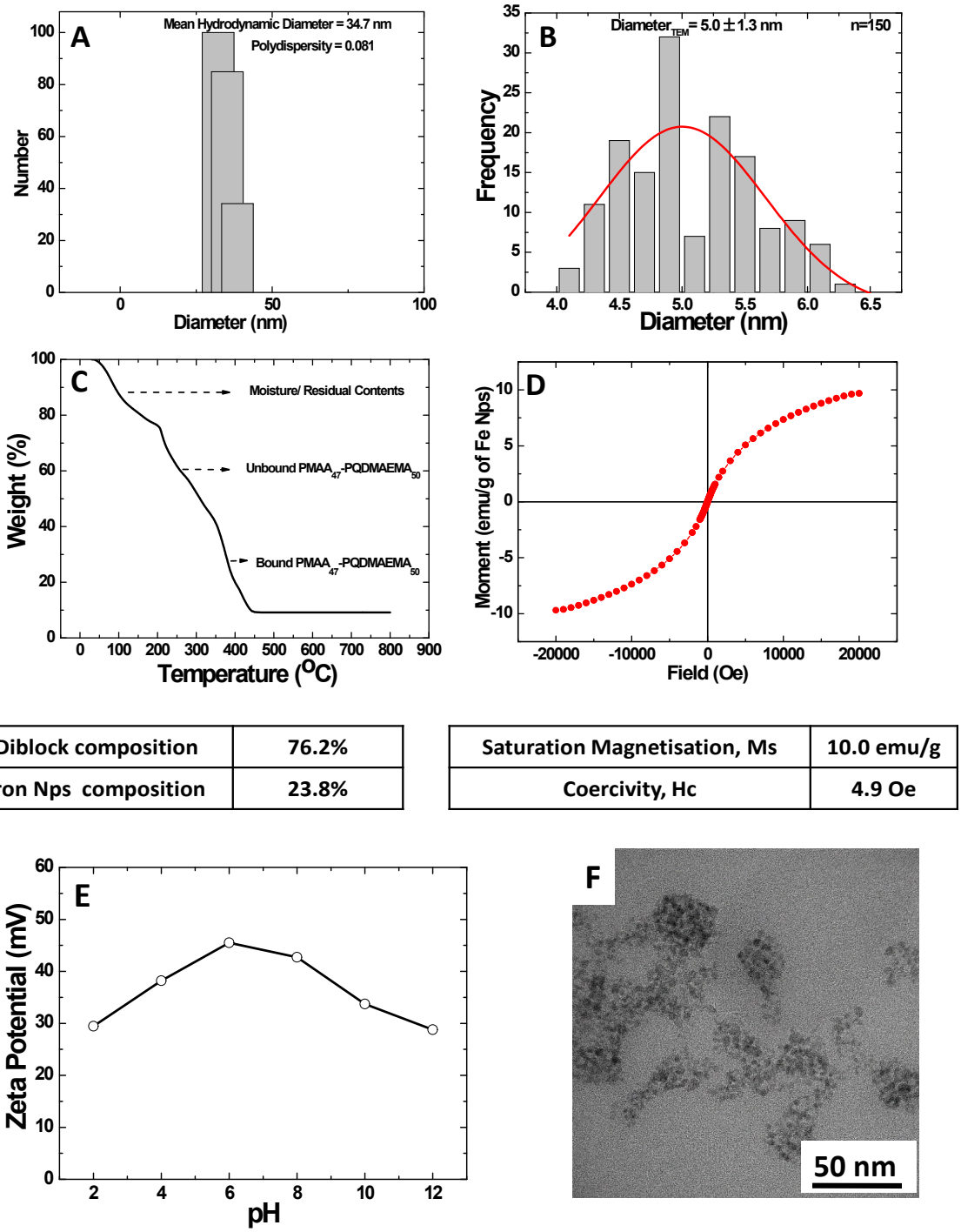


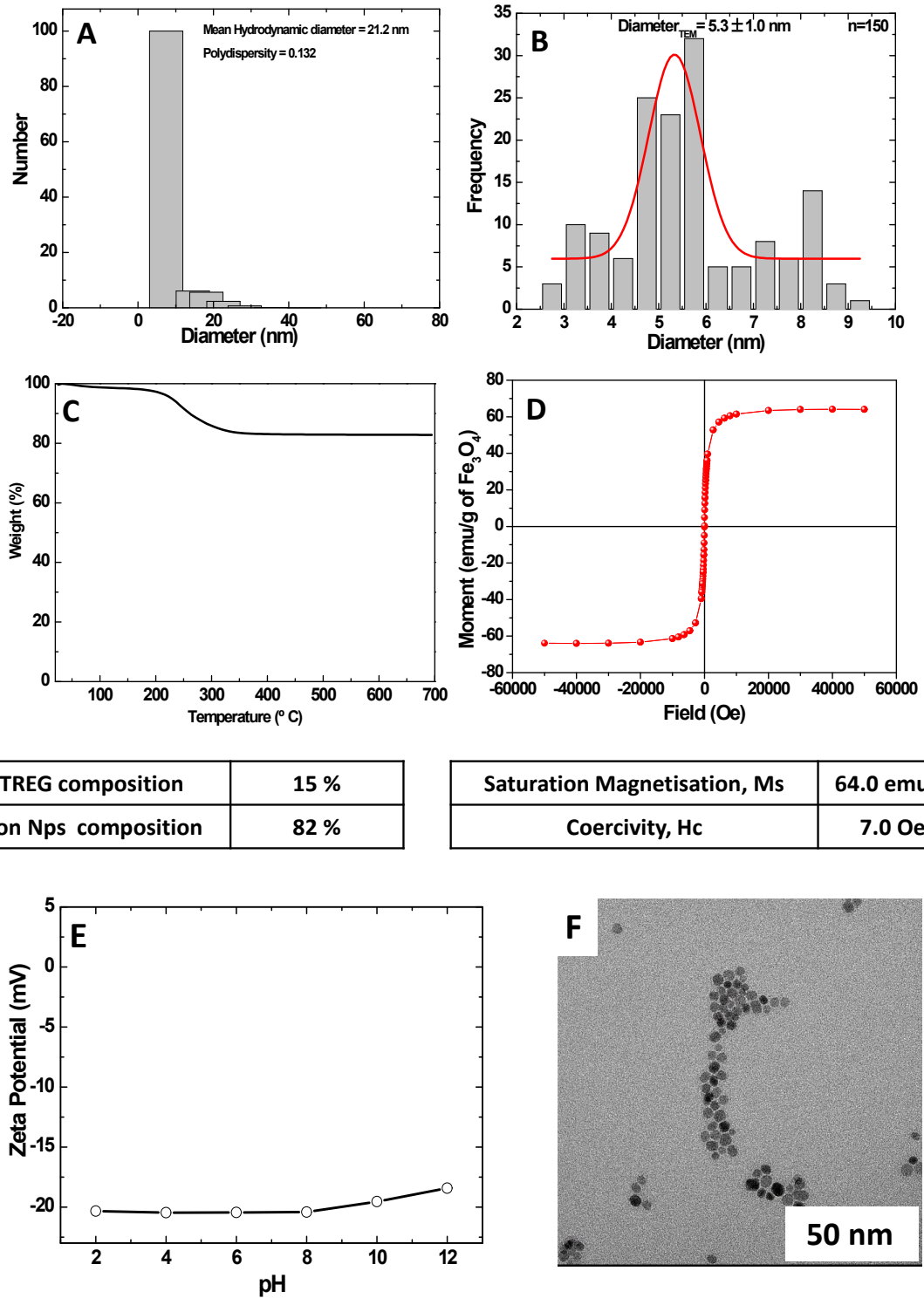
Figure S2. Characterization of PMAA$_{47}$-coated INPs, (A)- Hydrodynamic diameter by DLS, (B)- Diameter by TEM, (C) TGA analysis, (D)-VSM analysis, (E)- Zeta potential measurement, (F)- TEM image.



Diblock composition	76.2%
Iron Nps composition	23.8%

Saturation Magnetisation, Ms	10.0 emu/g
Coercivity, Hc	4.9 Oe

Figure S3. Characterization of $PMAA_{47}$-b-$PQDMAEMA_{50}$-coated INPs, (A)- Hydrodynamic diameter by DLS, (B)- Diameter by TEM, (C) TGA analysis, (D)-VSM analysis, (E)- Zeta potential measurement, (F)- TEM image.



TREG composition	15 %
Iron Nps composition	82 %

Saturation Magnetisation, Ms	64.0 emu/g
Coercivity, Hc	7.0 Oe

Figure S4. Characterization of DMSA-coated INPs, (A)- Hydrodynamic diameter by DLS, (B)- Diameter by TEM, (C) TGA analysis, (D)-VSM analysis, (E)- Zeta potential measurement, (F)- TEM image.

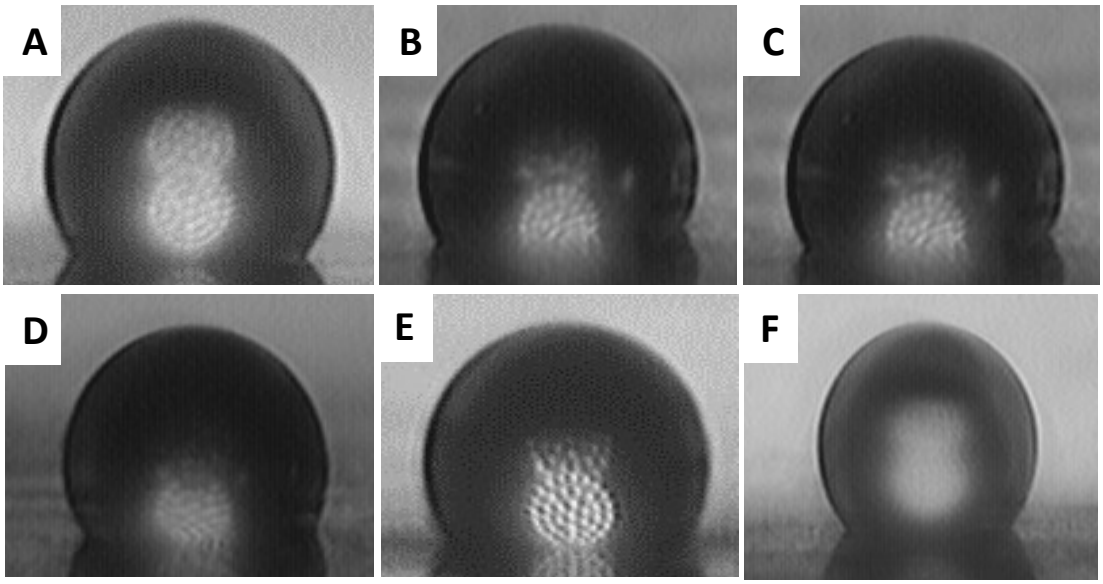


Figure	Contact Angle	Figure	Contact Angle
A	121	E	114
B	113	F	118
C	115	G	123
D	108		

Figure S5. Contact angle measurement for membranes prepared from diblock copolymer in THF with (A) 0.1 mL (B) 0.2 mL (C) 0.3 mL (D) 0.4 mL (E) 0.5 mL (F) 0.6 mL (G) 0.7 mL of water.

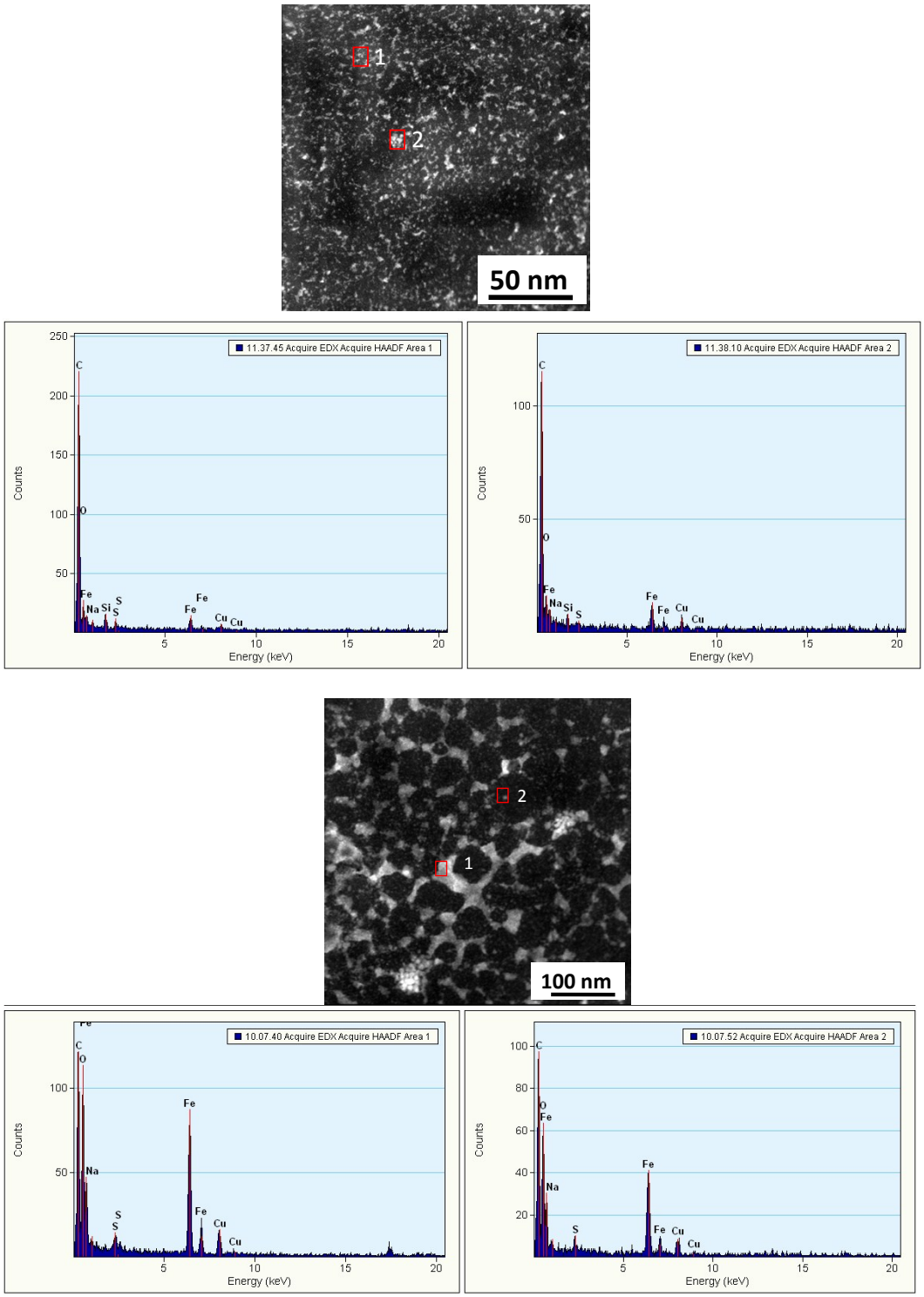


Figure S6. TEM EDX images of casting solution made from Diblock copolymer in THF (1.0 mL) and Iron core coated with DMSA (0.2 mL and 0.35 mL)

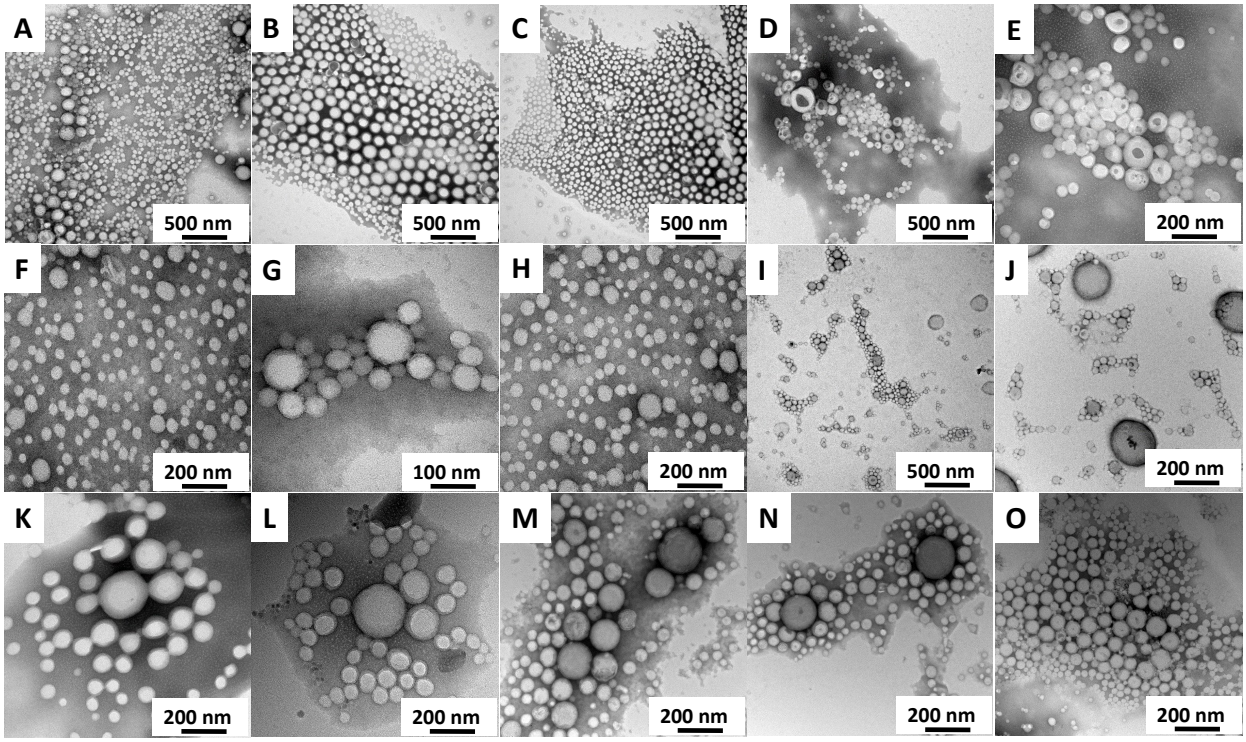


Figure S7. TEM images of polymeric nanoparticles formed by addition of 0.6 to 1.0 mL of water containing $PMAA_{47}$ covered INPs (A to E represents the samples taken every 0.1 mL of addition of bad solvent), $PMAA_{47}$-$PQDMAEMA_{50}$ covered INPs (F to J represents the samples taken every 0.1 mL of addition of bad solvent), DMSA covered INPs (K to O represents the samples taken every 0.1 mL of addition of bad solvent), into 1 mL of diblock copolymer in THF.

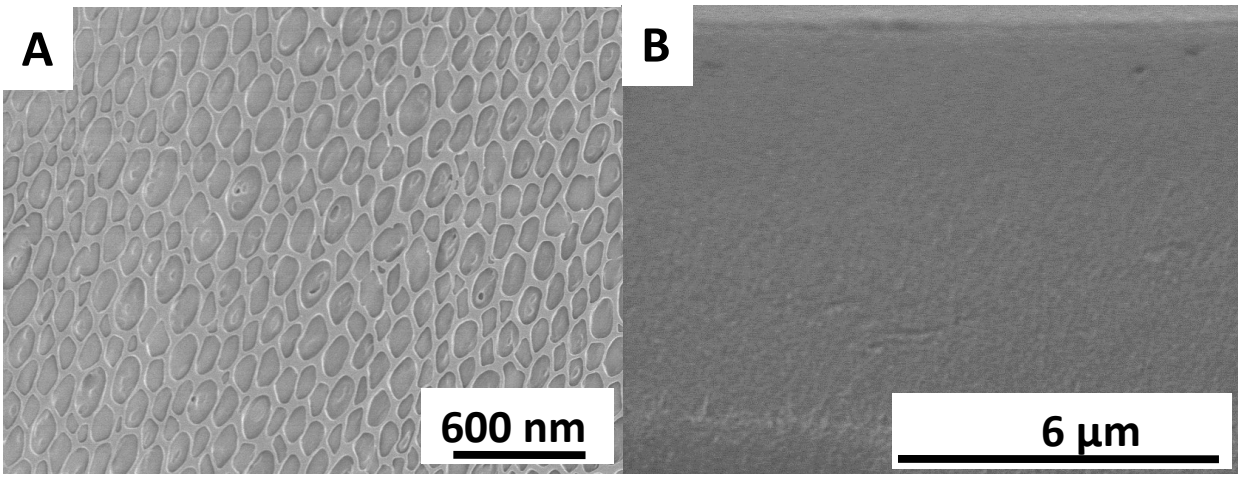


Figure S8. Membrane prepared from mixture of 1 mL of the diblock copolymer in THF and 2 mL of $PMAA_{47}$ coated INPs, fully dried before immersion in coagulation bath (A) top surface (B) cross section.

Table S2. Casting condition, estimated pore size and contact angle for tape casted membranes.

Amount of INP's dispersed in water (mL)	Relative Humidity (%)	Drying time (s)	pH of coagulation bath	Pore diameter range (nm)	Membrane thickness (μm)	Water contact angle (°)
0.2 (INPs -$PMAA_{47}$)	38	120	7.1	50 - 70	5.6	107
0.35 (INPs -$PMAA_{47}$)	38	120	7.1	60 - 80	5.9	115
0.2 (INPs- $PMAA_{47}$-$PQDMAEMA_{50}$)	38	120	7.1	50 - 300	7.3	101
0.35 (INPs- $PMAA_{47}$-$PQDMAEMA_{50}$)	38	120	7.1	50 - 300	6.6	104
0.2 (INPs- DMSA)	38	120	7.1	18 - 370	5.2	113
0.35 (INPs- DMSA)	38%	120	7.1	32 - 400	6.3	118

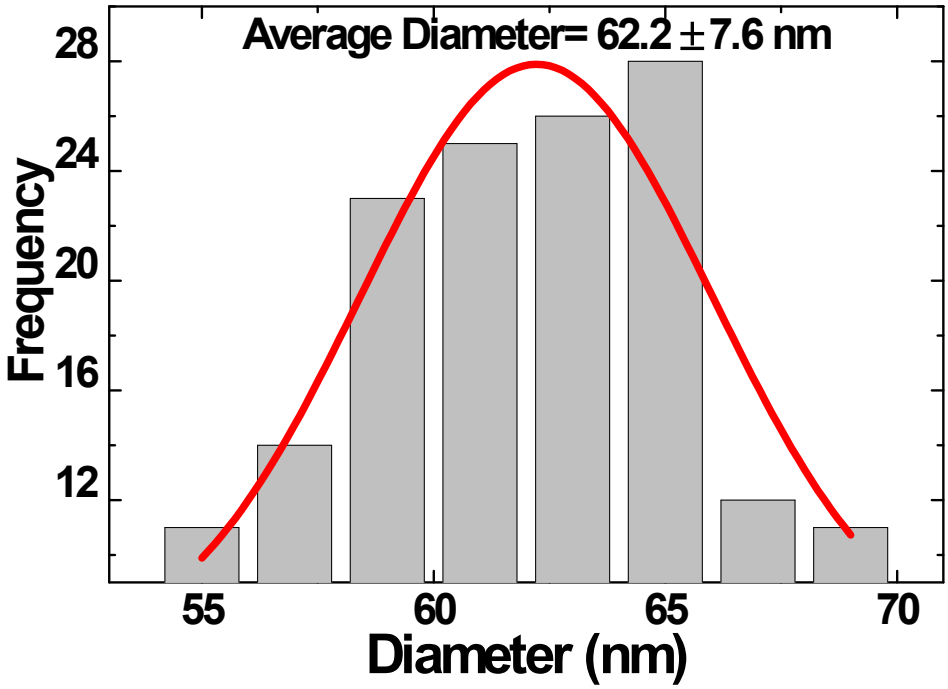


Figure S9. Pore size estimation for membranes from 0.2 mL of $PMAA_{47}$ coated INPs prepared using tape casting.

Flux and permeability

According to Darcy's law the volumetric flux could be calculated using the following equation

$Flux\ (J_V) = V_P/(t * S)$ (L. $h^{-1}.m^{-2}$) **Eqn (S1)**

$Permeability\ (L_P) = J_v/\ \Delta P$ (L. $h^{-1}.m^{-2}.bar^{-1}$) **Eqn (S2)**

Where V_p = Permeate volume, t = Time, S = Surface area and ΔP= pressure difference.

Table S3. Casting condition, estimated pore size and contact angle for spin coated membranes.

Amount of INP's dispersed in water (mL)	Relative Humidity (%)	Drying time at a velocity of 1500 rpm (s)	pH of Coagulation bath	Pore diameter range (nm)	Membrane thickness (µm)	Water contact angle (°)
0.2 (INPs -$PMAA_{47}$)	38	90	7.1	50 -70	2.8	100
0.35 (INPs -$PMAA_{47}$)	38	90	7.1	65-74	2.4	117
0.2 (INPs- $PMAA_{47}$-$PQDMAEMA_{50}$)	38	90	7.1	50 - 270	2.6	100
0.35 (INPs- $PMAA_{47}$-$PQDMAEMA_{50}$)	38	90	7.1	50 - 270	2.4	92
0.2 (INPs- DMSA)	38	90	7.1	50 - 400	2.3	119
0.35 (INPs- DMSA)	38	90	7.1	30 - 400	3.2	126