Supporting information for

Advantages of poly(vinyl phosphonic acid)-based double hydrophilic block copolymers for the stabilization of iron oxide nanoparticles

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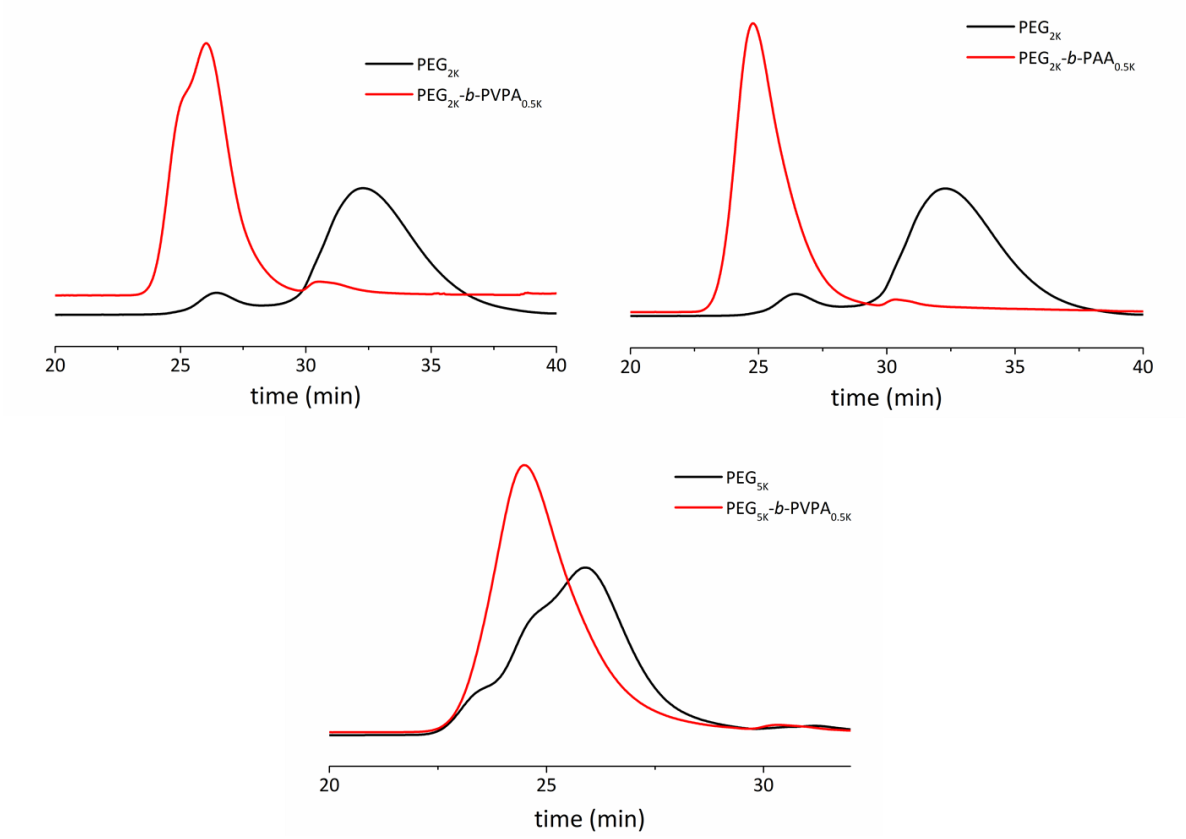
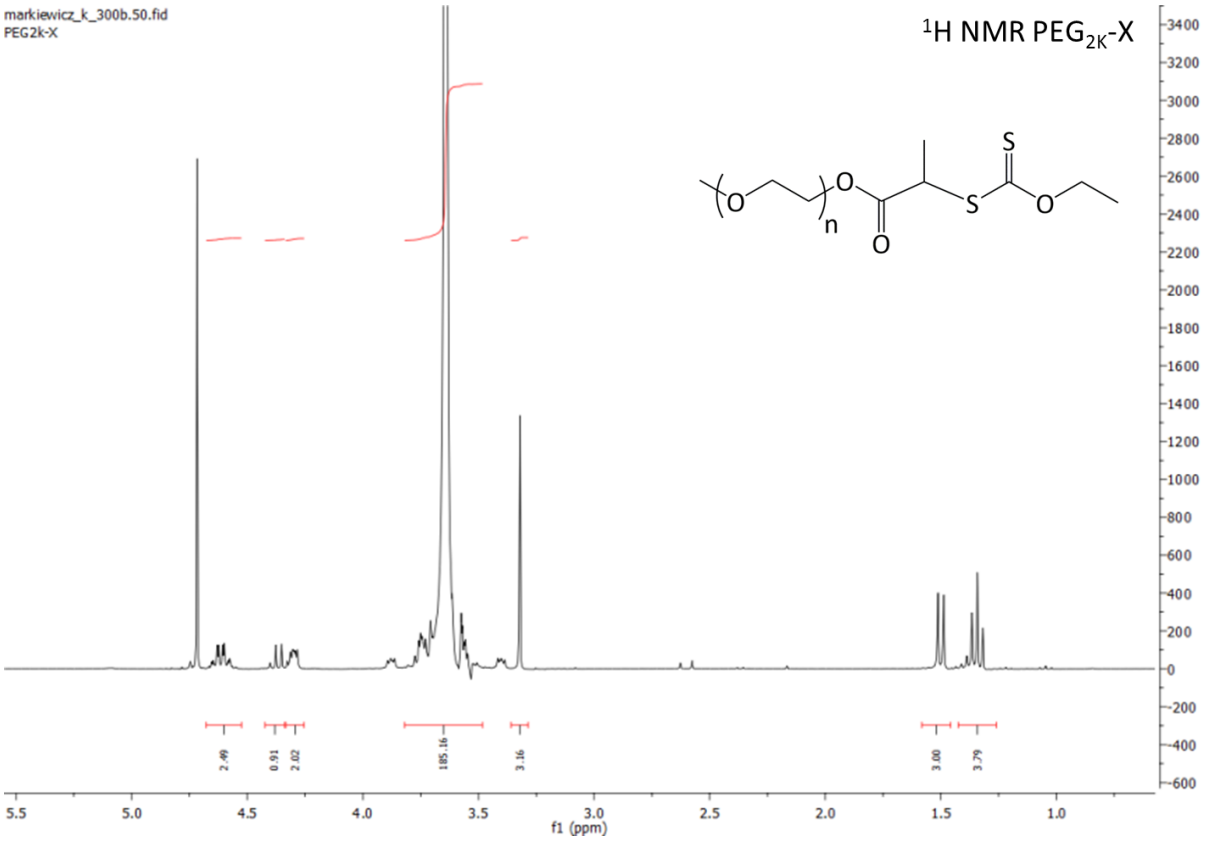


Figure S1A. SEC-RI chromatograms of polymers and copolymers used in reported study.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PEG2k-X
^{1}H NMR PEG$_{2K}$-X
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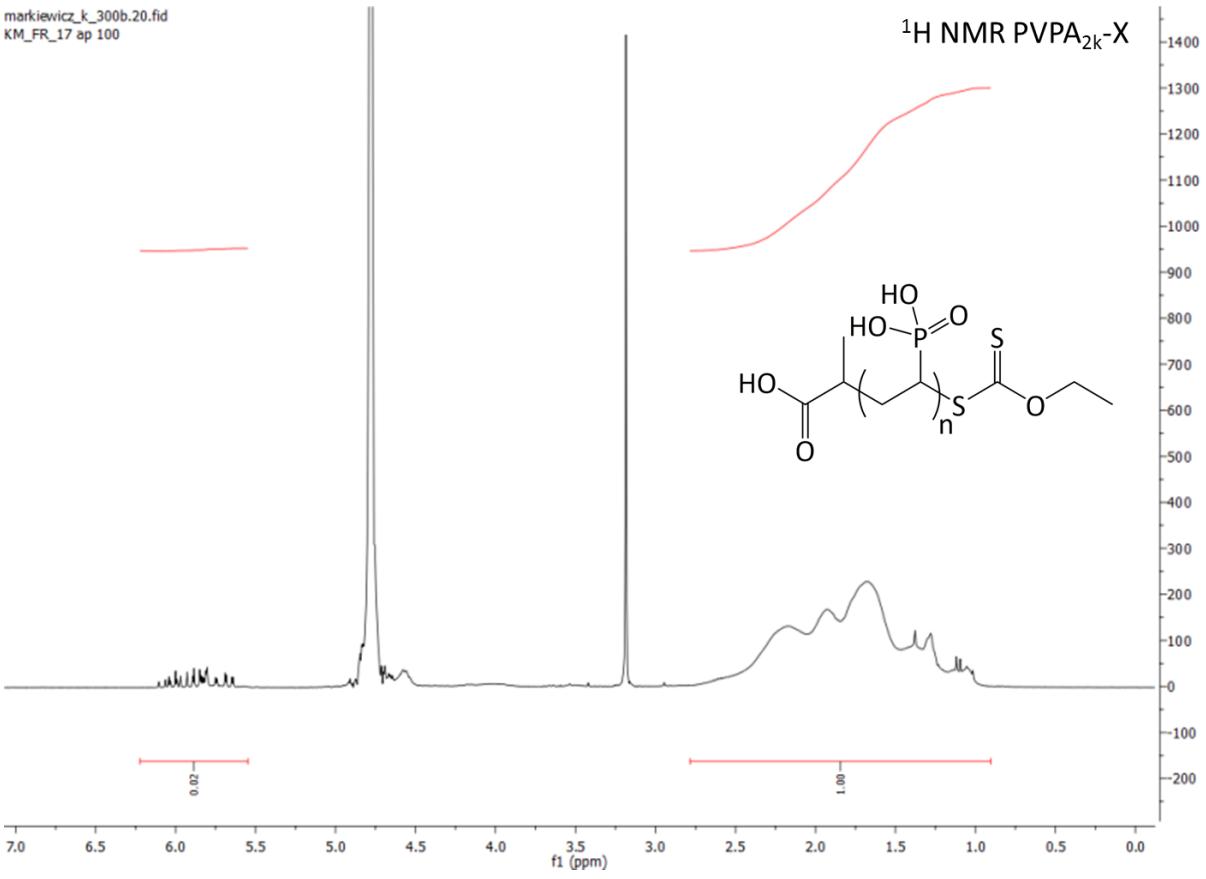
0.91
2.02
185.16
3.16
3.00
3.79
f1 (ppm)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KM_FR_17 ap 100
^{1}H NMR PVPA$_{2k}$-X
0.02
1.00
f1 (ppm)

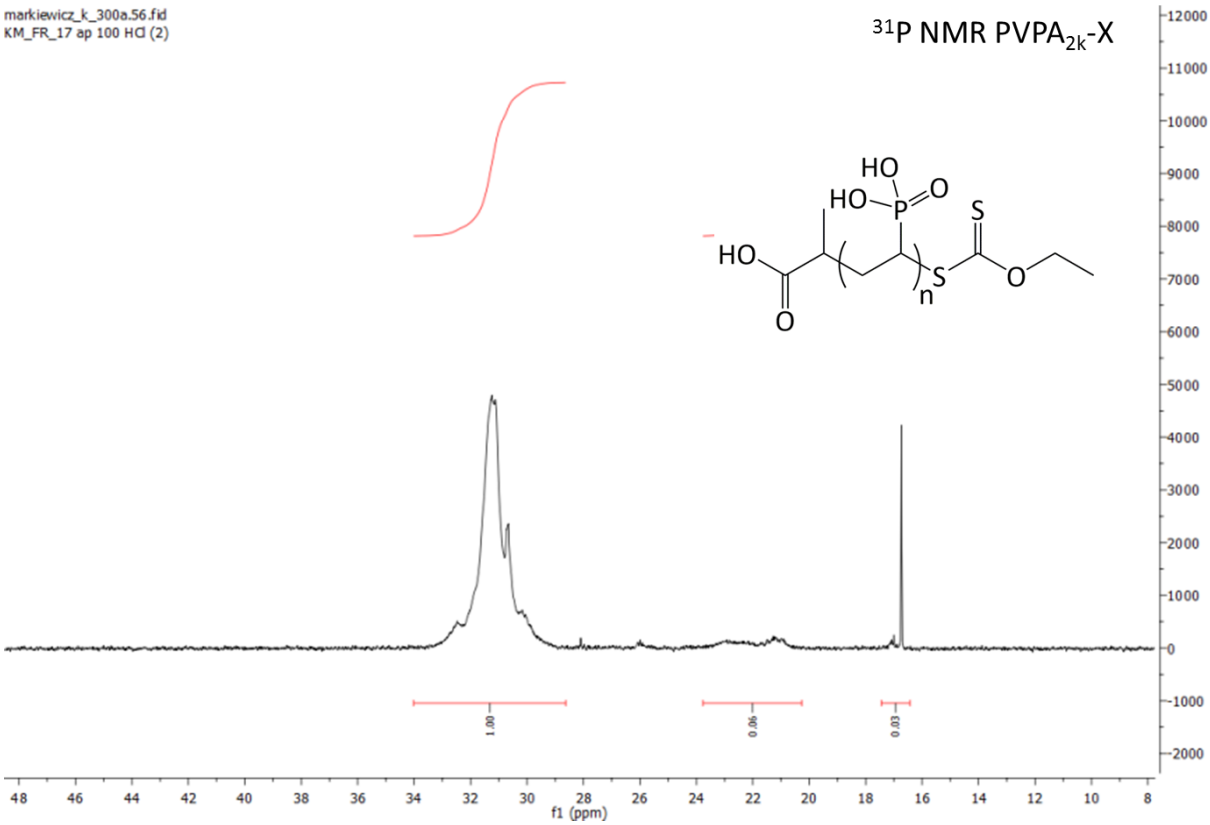
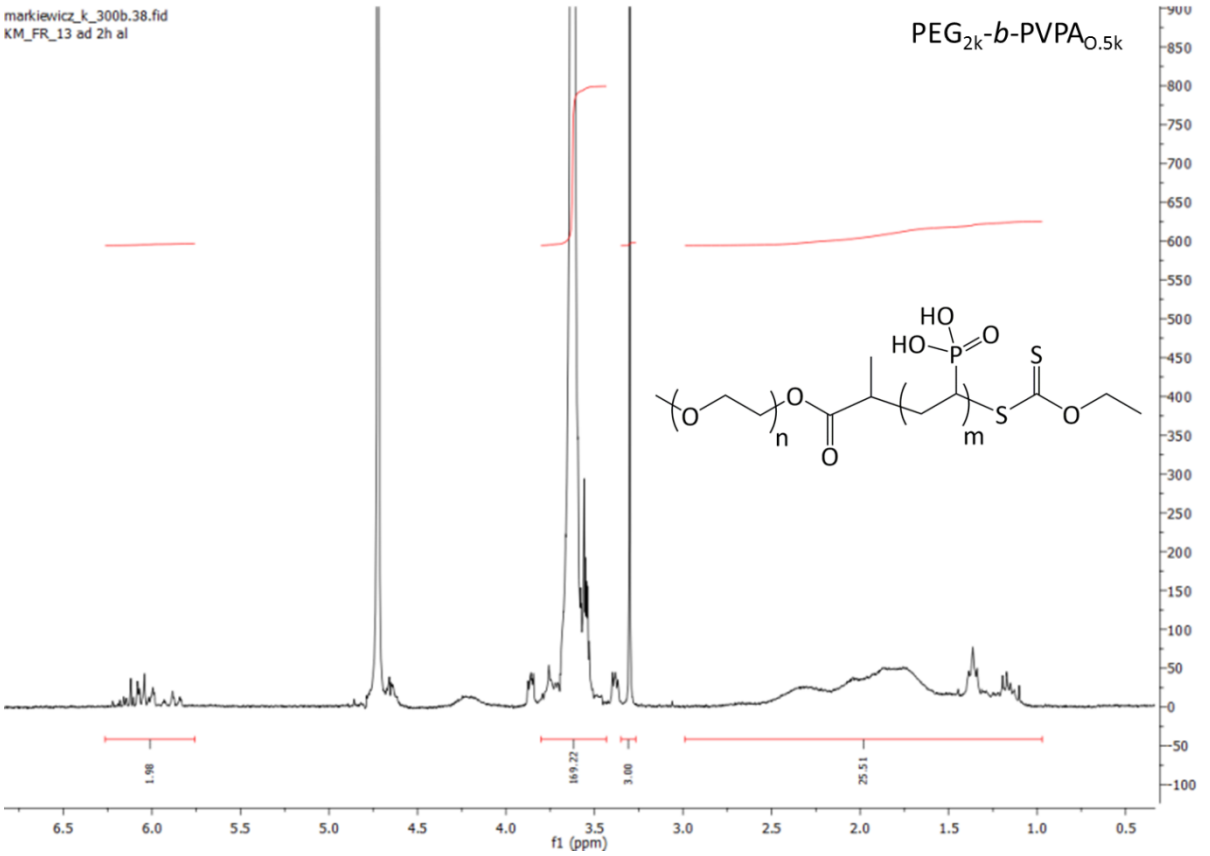
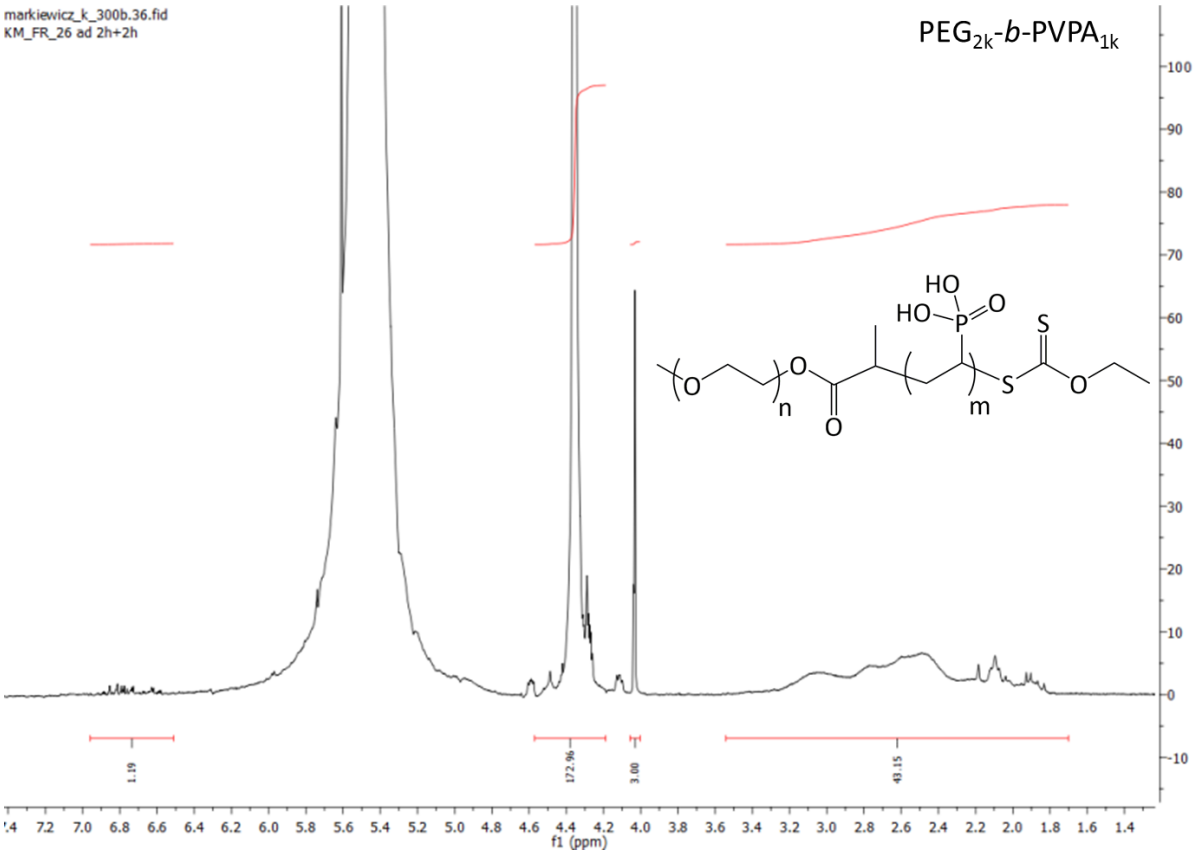
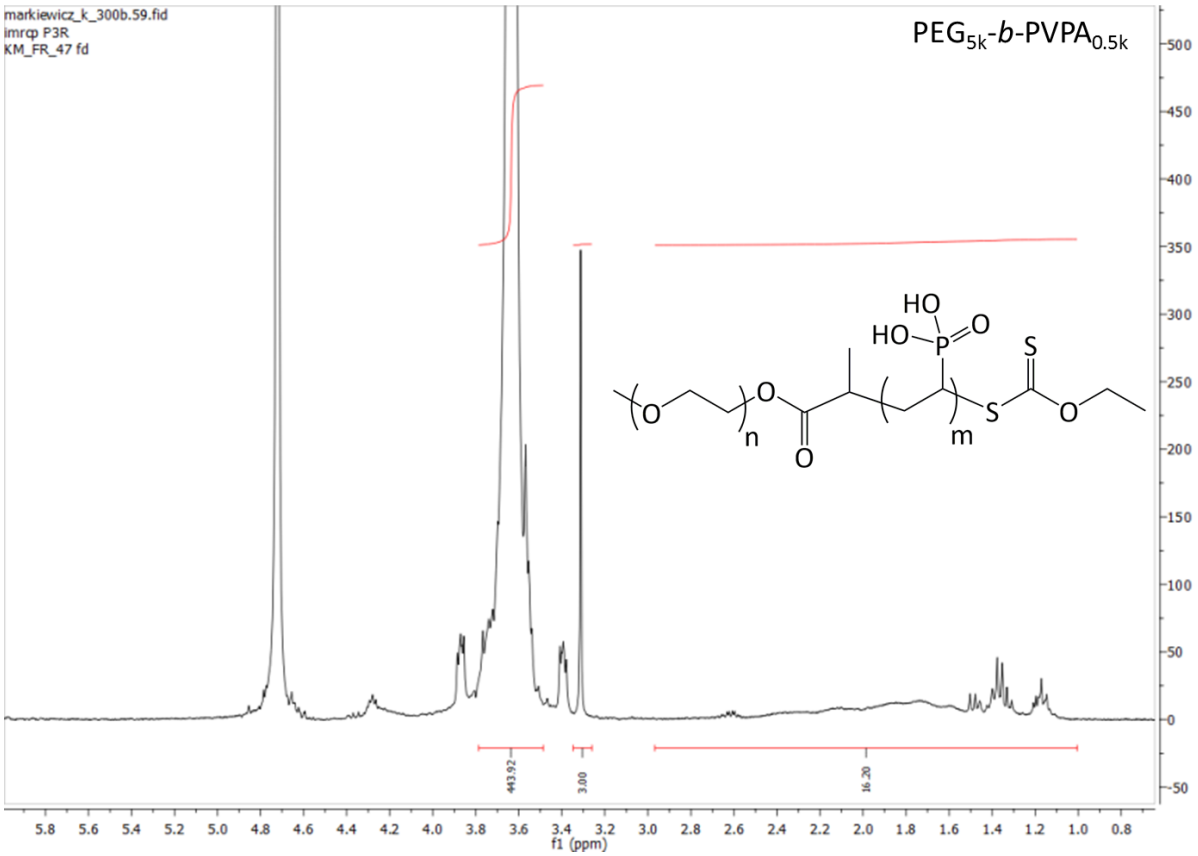


Figure S1B. ^{1}H NMR and ^{31}P NMR spectra of polymers used in reported study.




markiewicz_k_300b.36.fid
KM_FR_26 ad 2h+2h
PEG2k-b-PVPA1k
HO
HO
P
O
S
O
n
O
m
S
O
1.19
172.96
3.00
43.15
f1 (ppm)


markiewicz_k_300b.59.fid
imrcp P3R
KM_FR_47 fd
PEG5k-b-PVPA0.5k
HO
HO
P
O
S
O
n
O
m
S
O
443.92
3.00
16.20
f1 (ppm)

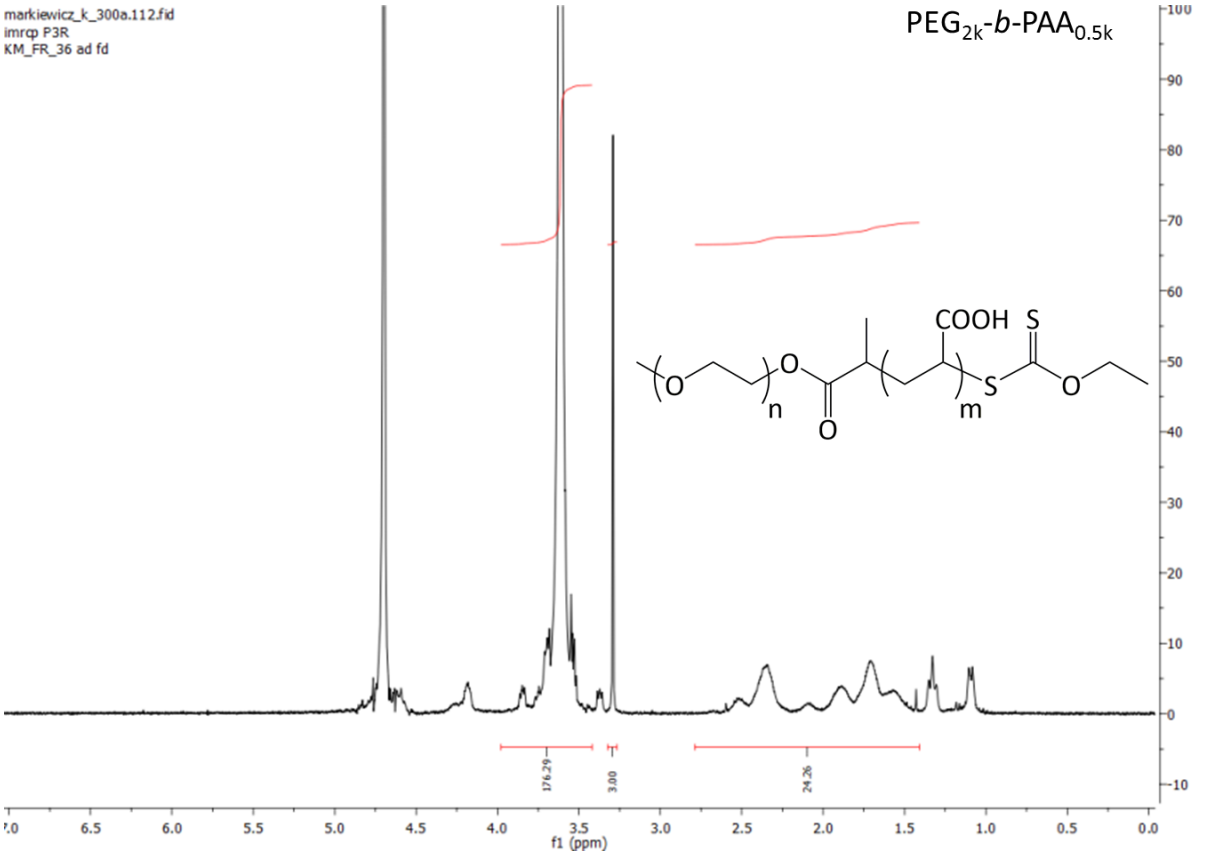
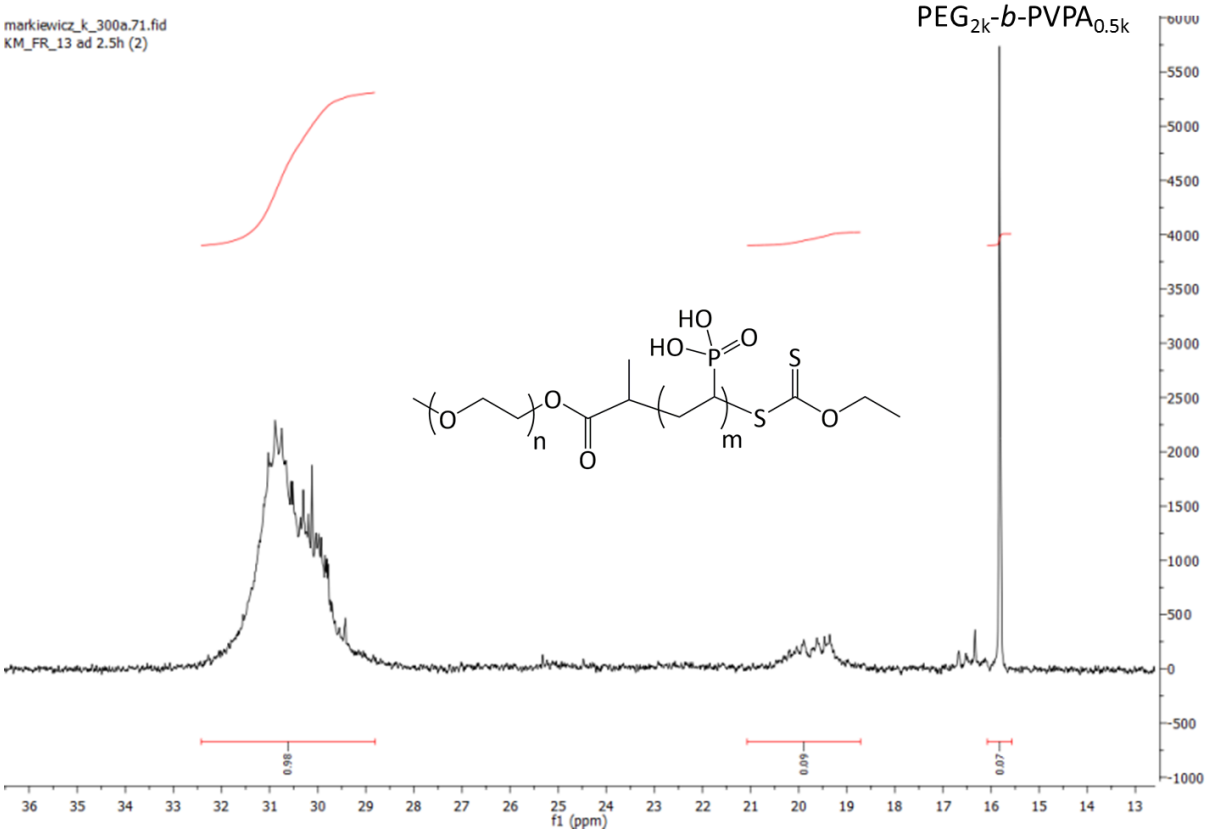
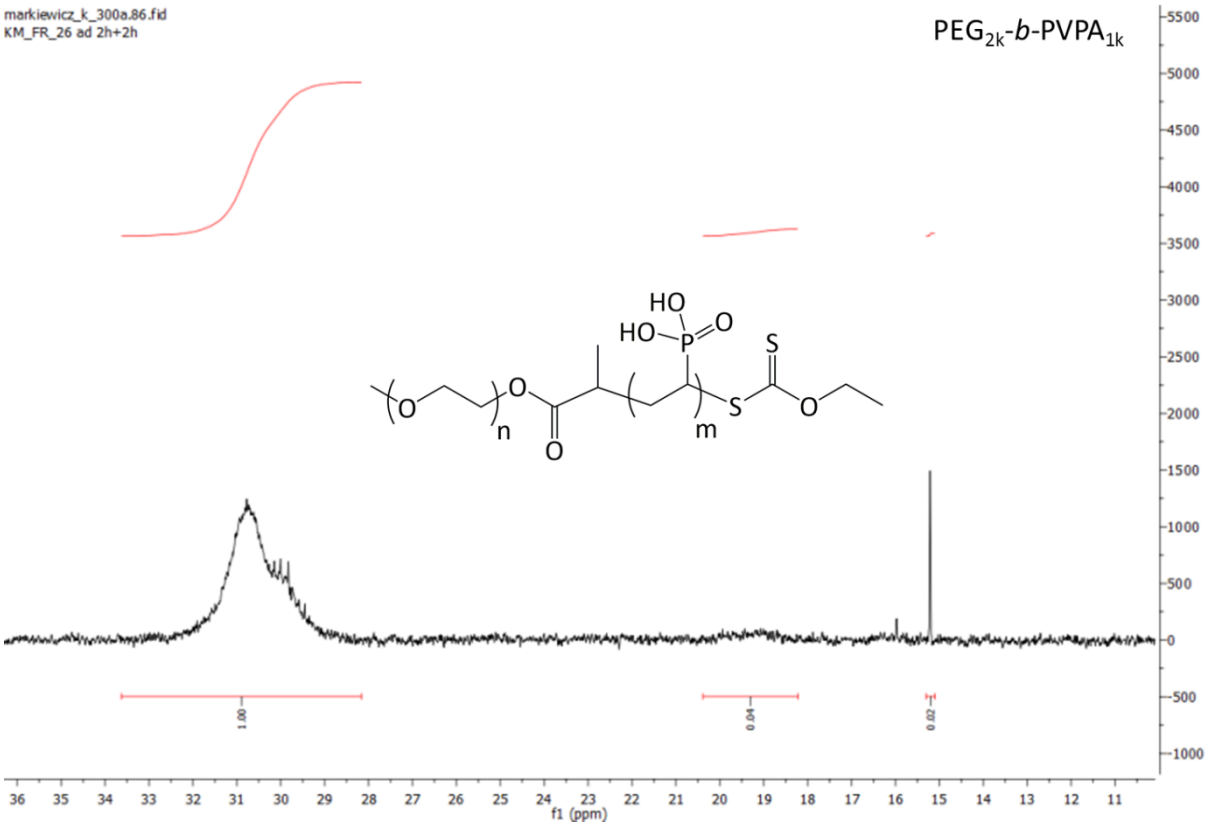


Figure S1C. ^{1}H NMR spectra of copolymers used in reported study.





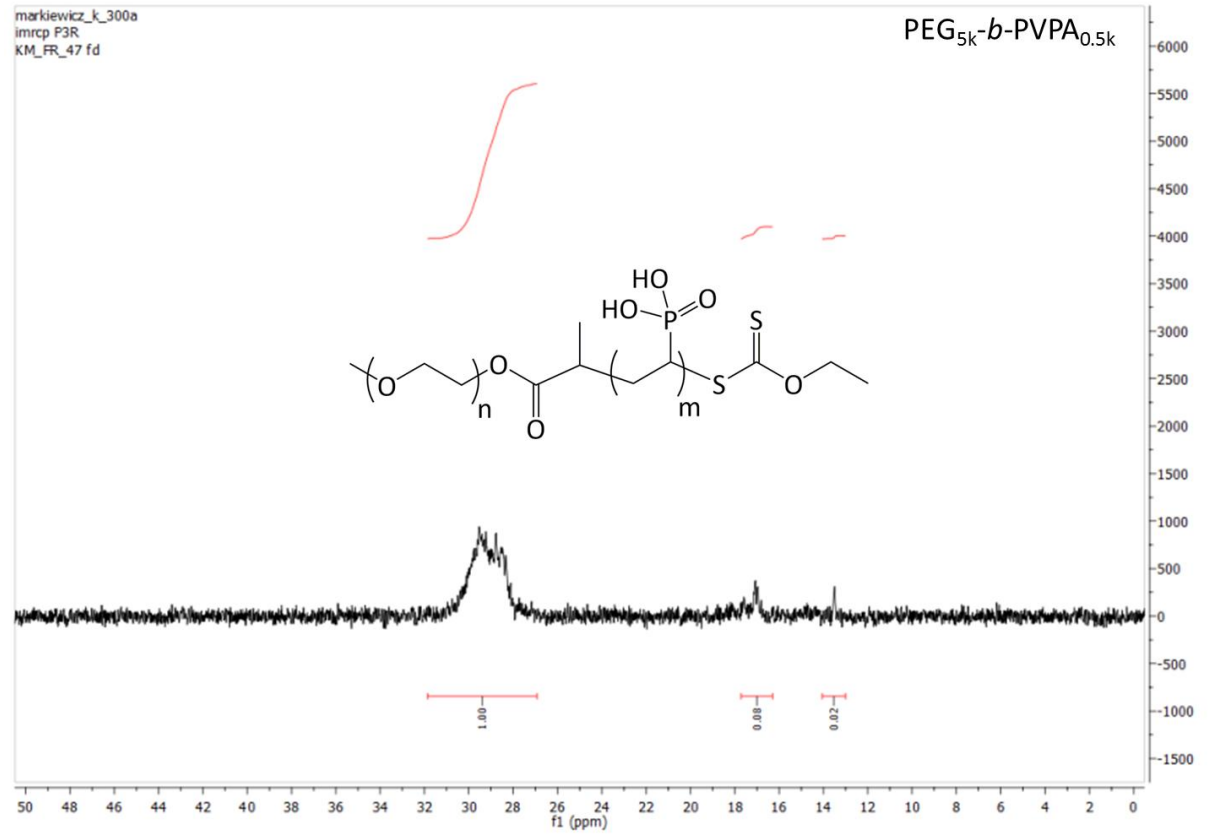


Figure S1D. ^{31}P NMR spectra of copolymers used in reported study.

Table S1. Summary of molecular weights of diblock copolymers used for stabilization of IONP based on SEC and ^{1}H NMR.

	dn/dc (mL/g)	$[monomer]_0$ (mol/L)	$[X]_0$ (mol/L)	Conv (%)	$M_{n\ th}$[a] ($g \cdot mol^{-1}$)	$M_{n,\ NMR}$[b] ($g \cdot mol^{-1}$)	$M_{n,\ SEC}$[c] ($g \cdot mol^{-1}$)	Đ	DP_n (SEC)
$PVPA_{1K}$	0.144	7.5	0.65	0.85	1253	-	2926	1.19	-
$PVPA_{2K}$	0.144	7.5	0.32	0.85	2346	-	4861	1.09	-
PEG_{2K}	0.131	-	-	-	2188	-	2330	1.09	-
PEG_{5K}	0.131	-	-	-	5176	-	5740	1.00	-
PEG_{2K}-*b*-$PVPA_{0.5K}$	0.134	4.48	0.24	0.50	3188	2890	2775	1.11	4.1
PEG_{2K}-*b*-$PVPA_{1K}$	0.135	4.80	0.16	0.50	3815	3525	3480	1.17	10.6
PEG_{2K}-*b*-$PAA_{0.5K}$	0.141	1.55	0.22	0.99	2690	2770	2863	1.03	7.4
PEG_{5K}-*b*-$PVPA_{0.5K}$	0.132	2.90	0.25	0.35	5615	5543	6360	1.09	5.7

[a] $M_{n\ th} = ([monomer]_0/[X]_0) \cdot Conv \cdot (Mmonomer) + M(X)$.
M_{VPA} = 108g/mol M_{AA} = 72g/mol M_X = 194g/mol $M_{PEG2K\text{-}X}$ = 2188 g/mol $M_{PEG5K\text{-}X}$ = 5176 g/mol
[b] Determined by ^{1}H NMR taking the weight of the PEG blocks into account.
[c] Measured by SEC-RI-MALS.

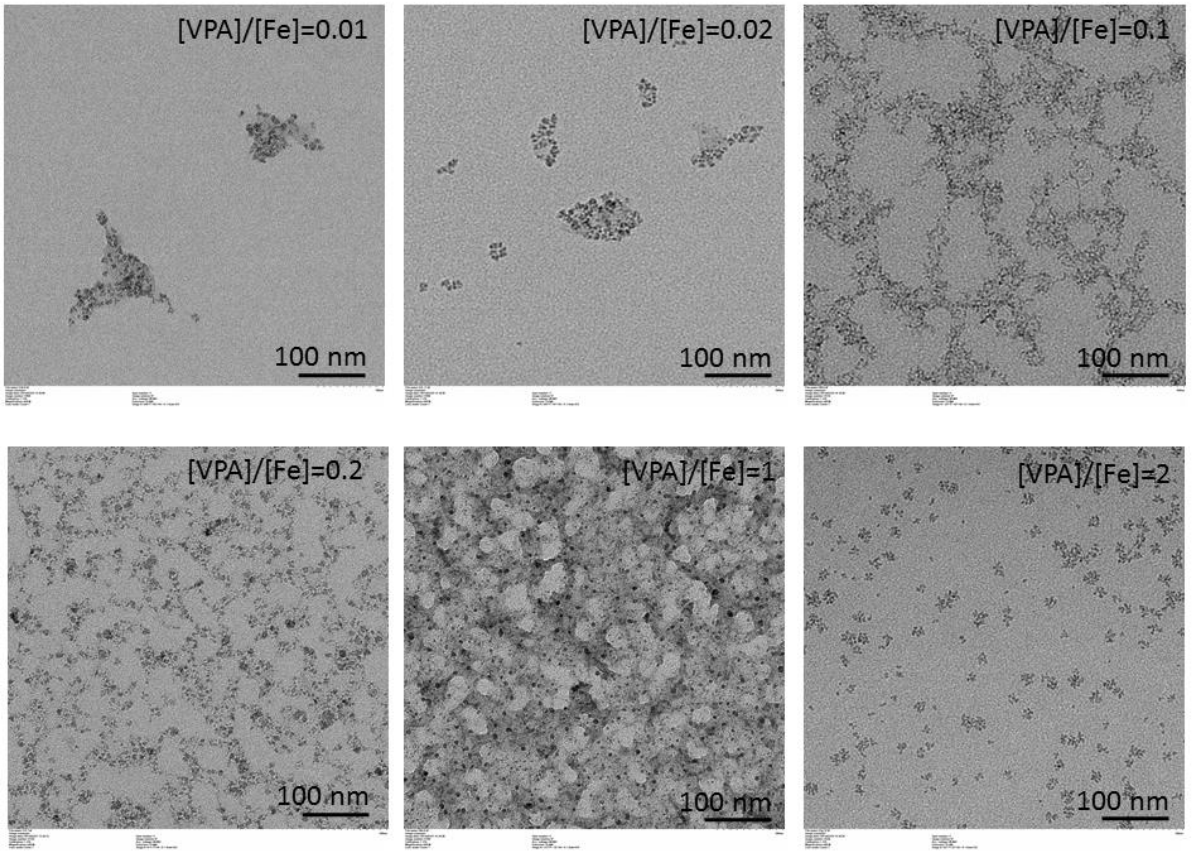


Figure S2. Effect of block copolymer concentration on NP growth for constant Fe concentration. TEM photographs of IONP@$PVPA_{0.5K}$-*b*-PEG_{2K} samples of different [VPA]:[Fe] molar ratio.

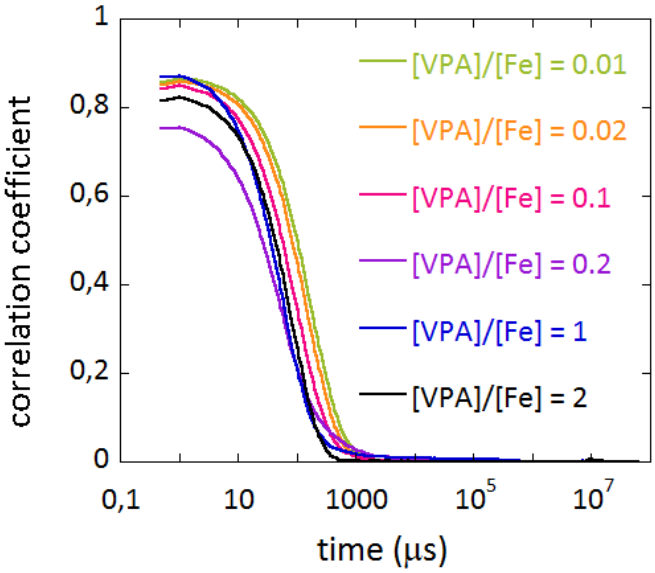


Figure S3. Effect of block copolymer concentration on NP growth for constant Fe concentration. Correlation coefficient graphs of IONP@PVPA$_{0.5K}$-*b*-PEG$_{2K}$ samples of different [VPA]:[Fe] molar ratio.

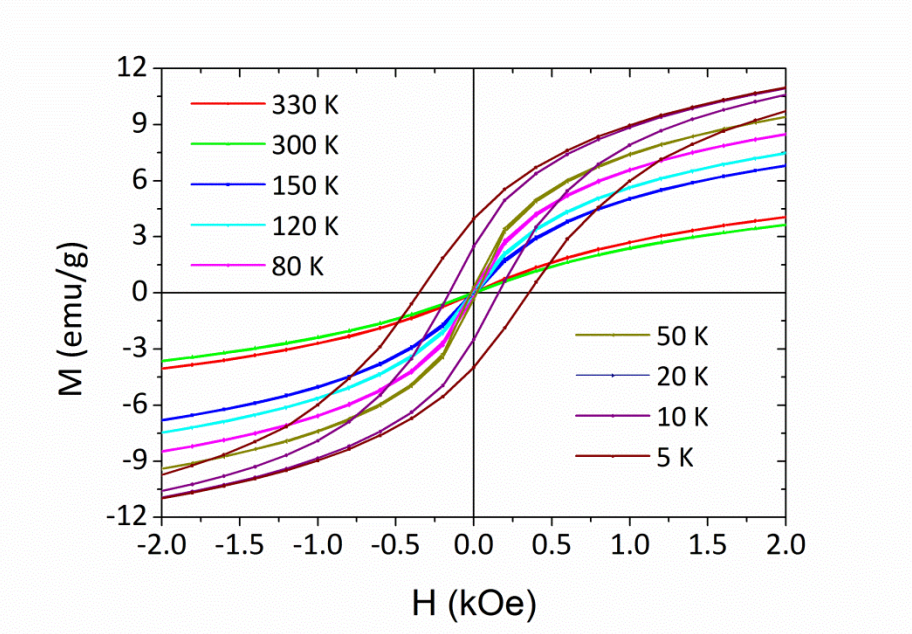


Figure S4. Magnetisation as a function of external magnetic field measured for IONP@PVPA$_{0.5K}$-*b*-PEG$_{2K}$ at various temperatures.

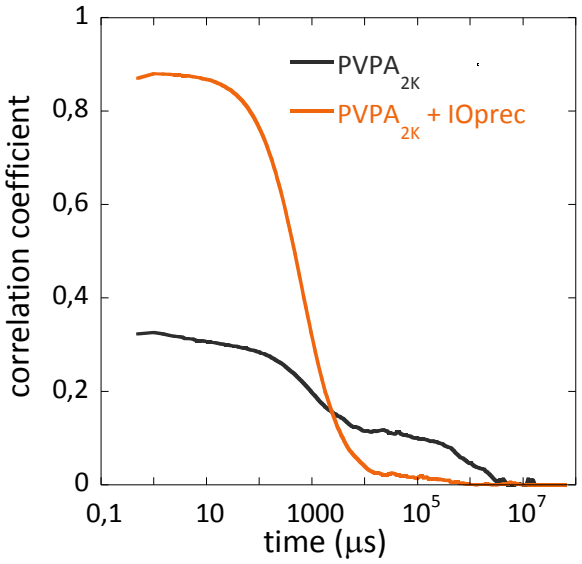


Figure S5. Correlation coefficient graphs of polymer $PVPA_{2K}$ solution (0.1wt%) and its mixture with iron oxide precursors ([VPA]/[Fe] = 1).

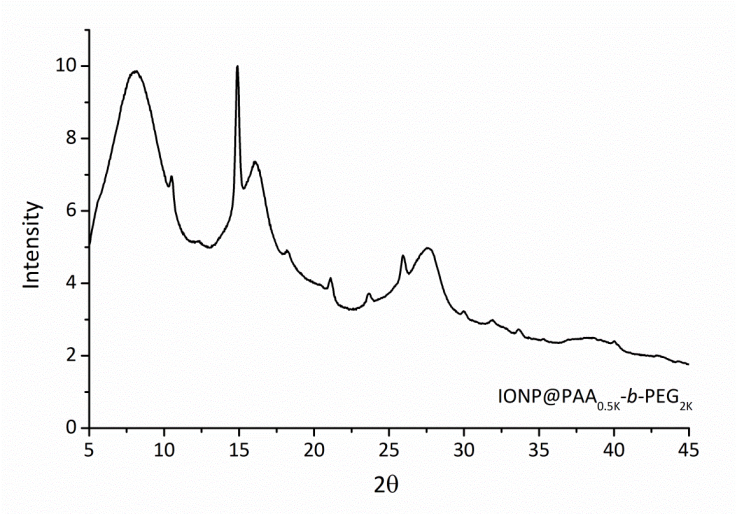


Figure S6. XRD pattern of IONP@$PAA_{0.5K}$-*b*-PEG_{2K} (P:Fe mass ratio 10:1).