Supporting Information

The influence of gradient and statistical arrangements of guanidinium or primary amine groups in poly(methacrylate) copolymers on their DNA binding affinity

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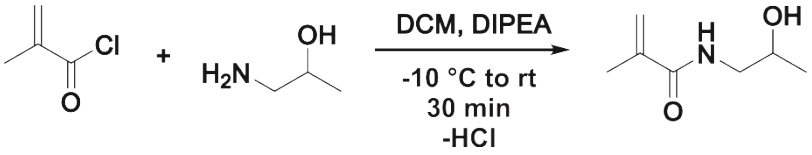
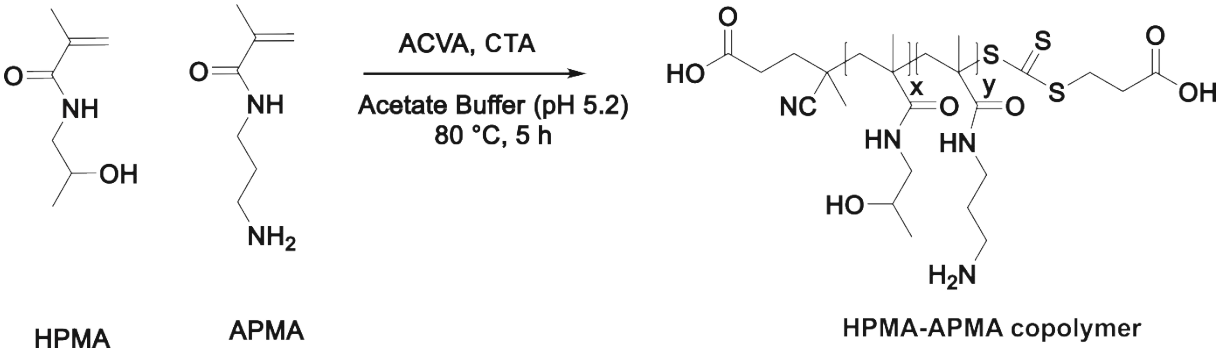
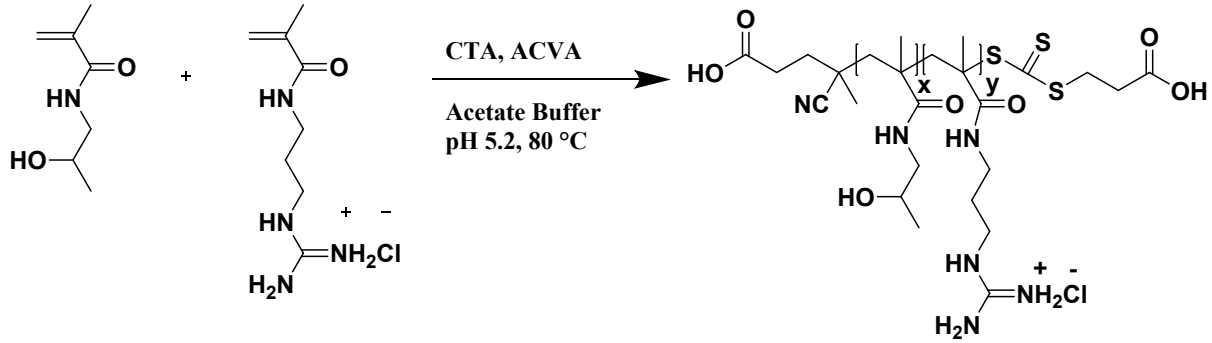


Scheme S1. Synthesis pathway for HPMA



HPMA APMA HPMA-APMA copolymer

Scheme S2. Synthesis pathway of HPMA-s-APMA



HPMA **GPMA** **HPMA-*stat*-GPMA macro CTA**

Scheme S3. Synthesis pathway of HPMA-s-GPMA

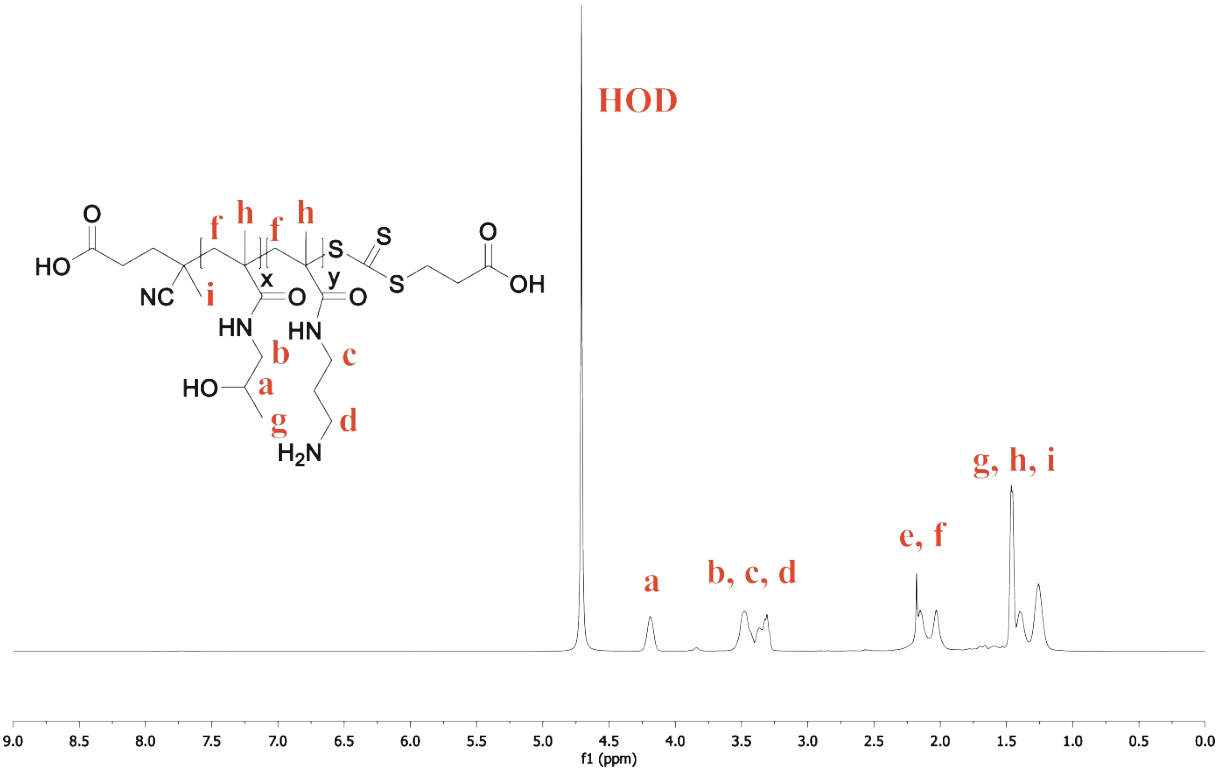


Figure S1. ^{1}H-NMR spectrum of ($HPMA_{90\%}$-s-$APMA_{10\%}$) in D_2O at 333 K (400 MHz)

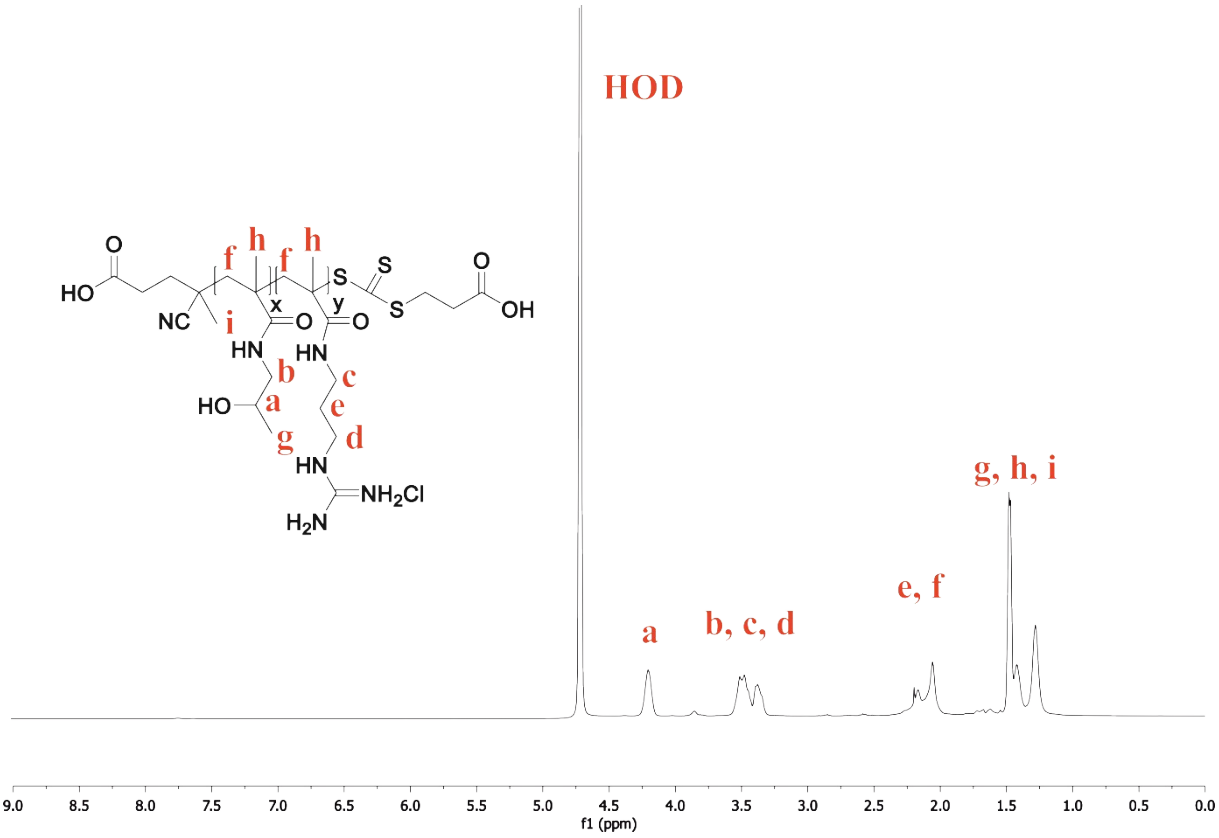


Figure S2. ^{1}H-NMR spectrum of ($HPMA_{90\%}$-s-$GPMA_{10\%}$) in D_2O at 333 K (400 MHz)

Table S1. Comonomer content (mol%) for P(HPMA-APMA) and P(HPMA-GPMA) copolymers during statistical copolymerization with aimed 40% HPMA and 60% APMA or GPMA mole content.

Polymerization Time (h)	HPMA (mol%)	APMA (mol%)
0	33.78	66.22
1	32.68	67.32
3	32.78	67.21
5	32.68	67.32
Polymerization Time	**HPMA (mol%)**	**GPMA (mol%)**
0	44.68	55.36
1	44.05	55.95
3	44.05	55.95
5	43.86	56.14

Table S2. Monomer addition rates in [mmol/h] of APMA and GPMA throughout the semi-batch copolymerization

Gradient copolymer with x mol% APMA/GPMA	monomer addition rate [mmol/h]
5%	0.097
10%	0.150
20%	0.276
40%	0.653
50%	0.954
60%	1.407
75%	2.764
90%	8.193

Table S3. The desired, theoretical and experimental APMA- or GPMA content in mole%, intrinsic viscosity ($[\eta]$), Huggins constants (k_H), partial specific volumes (υ) and the average total value of monomer units per polymer chain for each sample

Polymer	$M_{n,\,theo}$[a]	Co-monomer content			$[\eta]$ cm^3g^{-1}	k_H	υ cm^3g^{-1}	Monomers	
		desired	Theo[b]	Exp[c]				APMA or GPMA	HPMA
HPMA-*stat*-APMA$_{5\%}$	12100	5	12.0	8.9	7.6	1.8	0.78	7	72
HPMA-*stat*-APMA$_{10\%}$	12096	10	17.1	14.2	7.5	1.8	0.81	12	71
HPMA-*stat*-APMA$_{20\%}$	12095	20	27.3	23.4	8.2	1.7	0.79	18	59
HPMA-*stat*-APMA$_{40\%}$	12115	40	46.9	44.0	7.8	1.6	0.80	32	41
HPMA-*stat*-APMA$_{50\%}$	12134	50	56.4	54.1	9.0	1.3	0.77	36	31
HPMA-*stat*-APMA$_{60\%}$	12158	60	65.5	63.2	9.4	1.1	0.75	40	23
HPMA-*stat*-APMA$_{75\%}$	12203	75	78.8	77.6	9.7	1.1	0.74	51	15
HPMA-*stat*-APMA$_{90\%}$	12258	90	91.7	87.9	9.7	1.0	0.73	54	7
HPMA-*grad*-APMA$_{5\%}$	11907	5	18.8	6.7	7.2	1.8	0.80	5	73
HPMA-*grad*-APMA$_{10\%}$	11843	10	26.4	15.1	7.7	1.4	0.80	12	69
HPMA-*grad*-APMA$_{20\%}$	11767	20	39.7	25.8	8.1	1.5	0.79	21	60
HPMA-*grad*-APMA$_{40\%}$	11760	40	60.9	41.3	7.7	1.5	0.76	25	36
HPMA-*grad*-APMA$_{50\%}$	11805	50	69.5	47.7	7.4	1.4	0.77	28	31
HPMA-*grad*-APMA$_{60\%}$	11874	60	77.0	58.0	8.0	1.3	0.76	35	25
HPMA-*grad*-APMA$_{75\%}$	12010	75	86.8	80.6	8.6	1.2	0.73	47	11
HPMA-*grad*-APMA$_{90\%}$	12176	90	95.1	89.1	8.6	1.1	0.74	53	6
HPMA-*stat*-GPMA$_{5\%}$	11762	5	12.0	5.7	8.2	1.4	0.79	4	68
HPMA-*stat*-GPMA$_{10\%}$	11759	10	17.1	9.9	6.5	2.5	0.78	6	57
HPMA-*stat*-GPMA$_{20\%}$	11759	20	27.3	18.5	10.1	0.6	0.77	12	53
HPMA-*stat*-GPMA$_{40\%}$	11782	40	46.9	35.1	9.2	0.9	0.79	23	43
HPMA-*stat*-GPMA$_{50\%}$	11804	50	56.4	40.7	8.3	1.3	0.78	26	38
HPMA-*stat*-GPMA$_{60\%}$	11884	75	78.8	52.8	8.7	1.2	0.78	33	29
HPMA-*stat*-GPMA$_{90\%}$	11946	90	91.7	83.2	12.1	0.6	0.73	35	5
HPMA-*grad*-GPMA$_{5\%}$	11541	5	18.8	5.0	8.9	1.2	0.78	3	65
HPMA-*grad*-GPMA$_{10\%}$	11468	10	26.4	10.5	10.0	1.1	0.78	7	56
HPMA-*grad*-GPMA$_{20\%}$	11384	20	39.7	14.9	8.2	1.2	0.79	10	60
HPMA-*grad*-GPMA$_{40\%}$	11380	40	60.9	34.4	7.2	1.6	0.77	17	33
HPMA-*grad*-GPMA$_{50\%}$	11433	50	69.5	41.5	7.5	1.3	0.75	20	28
HPMA-*grad*-GPMA$_{60\%}$	11667	75	86.8	60.8	7.0	1.4	0.73	32	21
HPMA-*grad*-GPMA$_{90\%}$	11854	90	95.1	84.4	10.0	1.4	0.72	35	5

[a)]The theoretical molar mass was calculated using the Formula $M_{n,th} = ([M]_0/[CTA]_0)M_{w,\,monomer}\rho + M_{w,CTA}$ while the conversion ρ was near quantitative (≥95%); [b)]according to the used stoichiometry; [c)]determined via ^{1}H-NMR.

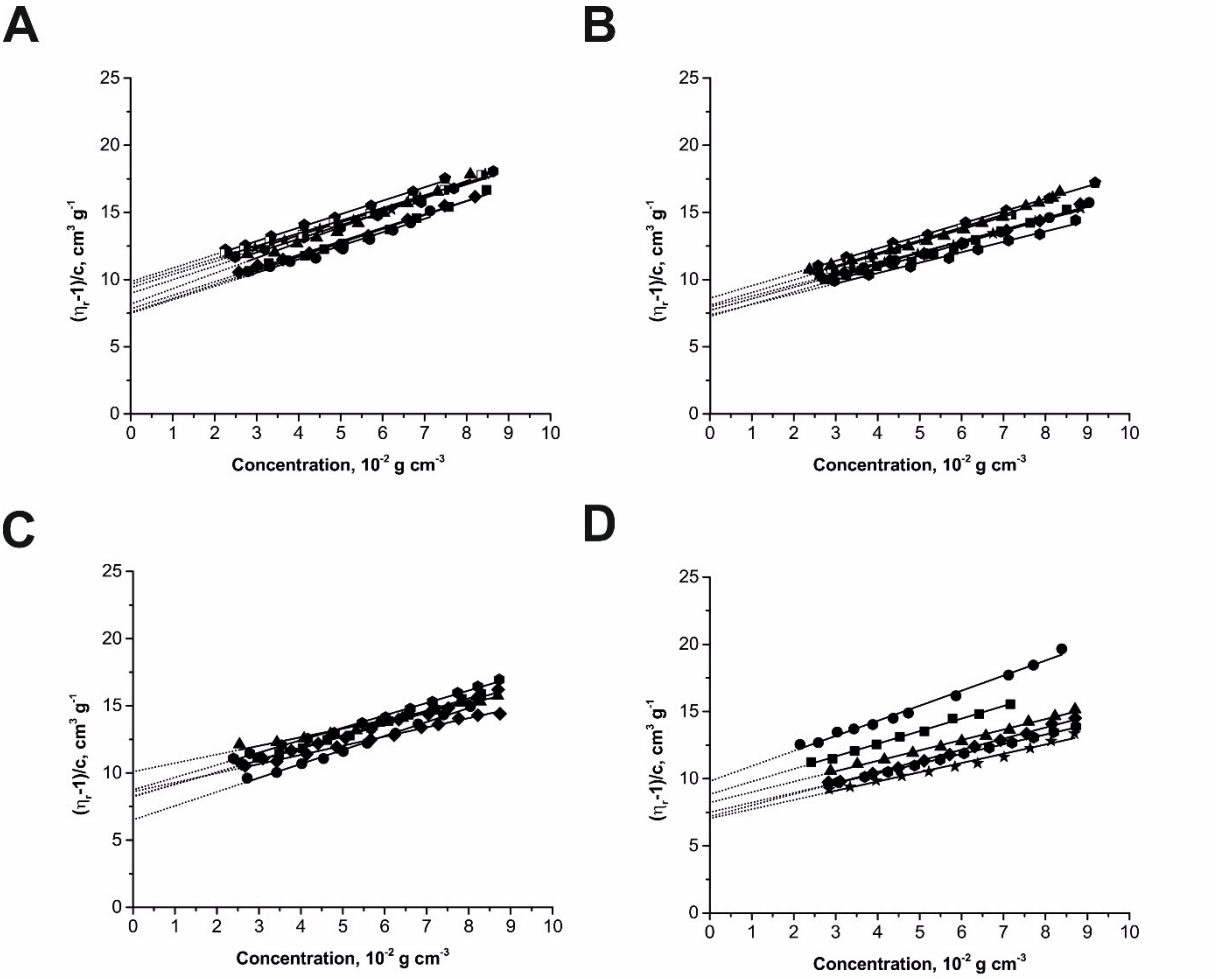


Figure S3. Plots to determine intrinsic viscosities, [η], and Huggins constant, k_H, after eq. 1 of (A) statistical copolymers of HPMA and APMA, (B) the gradient copolymers of HPMA and APMA, (C) the statistical copolymers of HPMA and GPMA, and (D) the gradient copolymers of HPMA and GPMA. Fits to eq 1 are shown as solid lines and extrapolations to determine [η] as dotted lines. Symbol assignment for polymers: **Squares** $HPMA_{95\%}$-s-$APMA_{5\%}$ $HPMA_{95\%}$-g-$APMA_{5\%}$ / $HPMA_{95\%}$-s-$GPMA_{5\%}$ / $HPMA_{95\%}$-g-$GPMA_{5\%}$; **circles** $HPMA_{90\%}$-s-$APMA_{10\%}$ / $HPMA_{90\%}$-g-$APMA_{10\%}$ / $HPMA_{90\%}$-s-$GPMA_{10\%}$ / $HPMA_{90\%}$-g-$GPMA_{10\%}$; **triangles** $HPMA_{80\%}$-s-$APMA_{20\%}$ / $HPMA_{80\%}$-g-$APMA_{20\%}$ / $HPMA_{80\%}$-s-$GPMA_{20\%}$ / $HPMA_{80\%}$-g-$GPMA_{20\%}$; **diamonds** $HPMA_{60\%}$-s-$APMA_{40\%}$ / $HPMA_{60\%}$-g-$APMA_{40\%}$ / $HPMA_{60\%}$-s-$GPMA_{40\%}$ / $HPMA_{60\%}$-g-$GPMA_{40\%}$; **hexagons** $HPMA_{50\%}$-s-$APMA_{50\%}$ / $HPMA_{50\%}$-g-$APMA_{50\%}$ / $HPMA_{50\%}$-s-$GPMA_{50\%}$ / $HPMA_{50\%}$-g-$GPMA_{50\%}$; **stars** $HPMA_{40\%}$-s-$APMA_{60\%}$ / $HPMA_{40\%}$-g-$APMA_{60\%}$; **pentagons** $HPMA_{25\%}$-s-$APMA_{75\%}$ / $HPMA_{25\%}$-g-$APMA_{75\%}$ /

$HPMA_{25\%}$-s-$GPMA_{75\%}$ / $HPMA_{25\%}$-g-$GPMA_{75\%}$; **half-filled squares** $HPMA_{10\%}$-s-$APMA_{90\%}$ / $HPMA_{10\%}$-g-$APMA_{90\%}$ / $HPMA_{10\%}$-s-$GPMA_{90\%}$ / $HPMA_{10\%}$-g-$GPMA_{90\%}$.

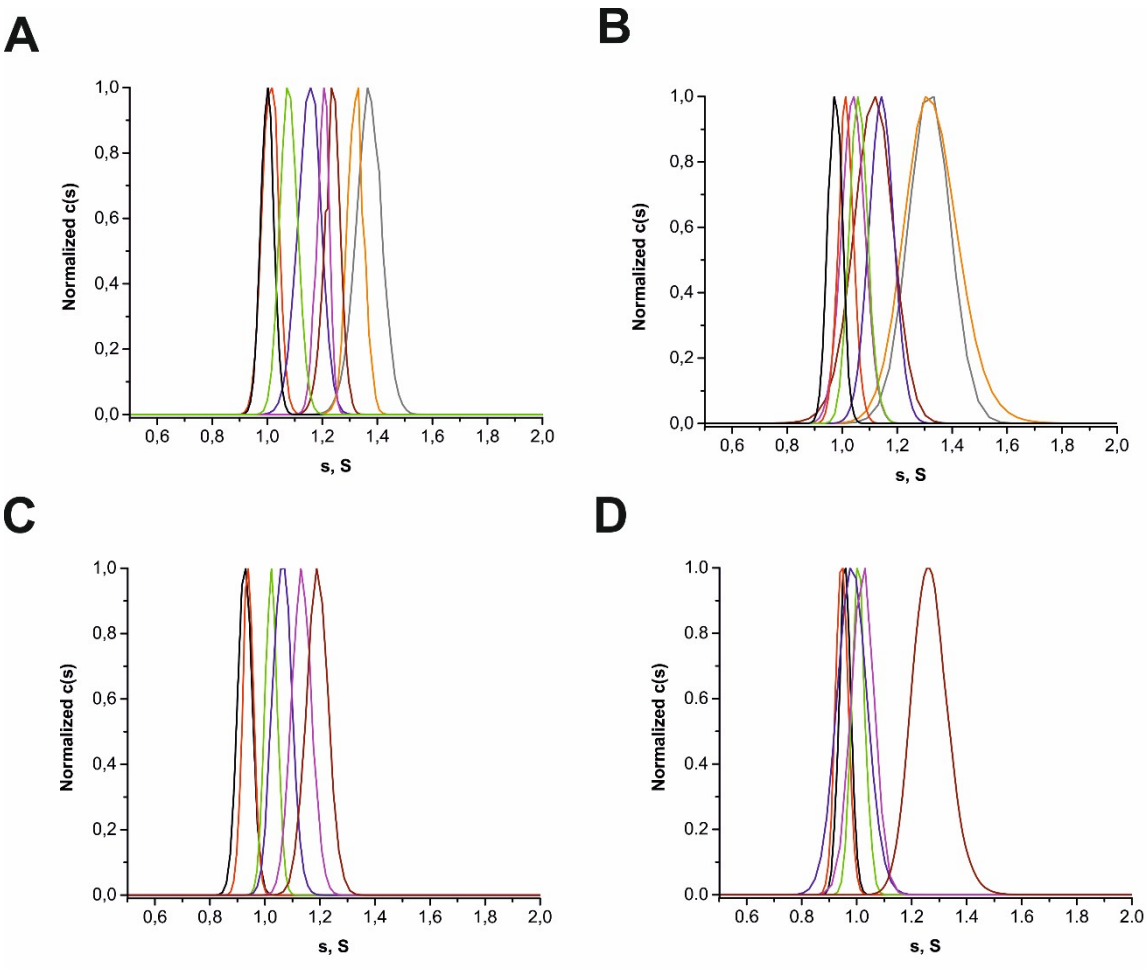


Figure S4. Example differential distributions of sedimentation coefficients, s, of (A) statistical copolymers of HPMA and APMA, (B) the gradient copolymers of HPMA and APMA, (C) the statistical copolymers of HPMA and GPMA, and (D) the gradient copolymers of HPMA and GPMA. Trace color assignment: **black** $HPMA_{95\%}$-s-$APMA_{5\%}$ $HPMA_{95\%}$-g-$APMA_{5\%}$ / $HPMA_{95\%}$-s-$GPMA_{5\%}$ / $HPMA_{95\%}$-g-$GPMA_{5\%}$; **red** $HPMA_{90\%}$-s-$APMA_{10\%}$ / $HPMA_{90\%}$-g-$APMA_{10\%}$ / $HPMA_{90\%}$-s-$GPMA_{10\%}$ / $HPMA_{90\%}$-g-$GPMA_{10\%}$; **green** $HPMA_{80\%}$-s-$APMA_{20\%}$ / $HPMA_{80\%}$-g-$APMA_{20\%}$ / $HPMA_{80\%}$-s-$GPMA_{20\%}$ / $HPMA_{80\%}$-g-$GPMA_{20\%}$; **blue** $HPMA_{60\%}$-s-$APMA_{40\%}$ / $HPMA_{60\%}$-g-$APMA_{40\%}$ / $HPMA_{60\%}$-s-$GPMA_{40\%}$ / $HPMA_{60\%}$-g-$GPMA_{40\%}$; **magenta** $HPMA_{50\%}$-s-$APMA_{50\%}$ / $HPMA_{50\%}$-g-$APMA_{50\%}$ / $HPMA_{50\%}$-s-$GPMA_{50\%}$ / $HPMA_{50\%}$-g-$GPMA_{50\%}$; **wine** $HPMA_{40\%}$-s-$APMA_{60\%}$ / $HPMA_{40\%}$-g-$APMA_{60\%}$; **orange** $HPMA_{25\%}$-s-$APMA_{75\%}$ / $HPMA_{25\%}$-g-$APMA_{75\%}$ / $HPMA_{25\%}$-s-$GPMA_{75\%}$ / $HPMA_{25\%}$-g-$GPMA_{75\%}$; **gray** $HPMA_{10\%}$-s-$APMA_{90\%}$ / $HPMA_{10\%}$-g-$APMA_{90\%}$ / $HPMA_{10\%}$-s-$GPMA_{90\%}$ / $HPMA_{10\%}$-g-$GPMA_{90\%}$.

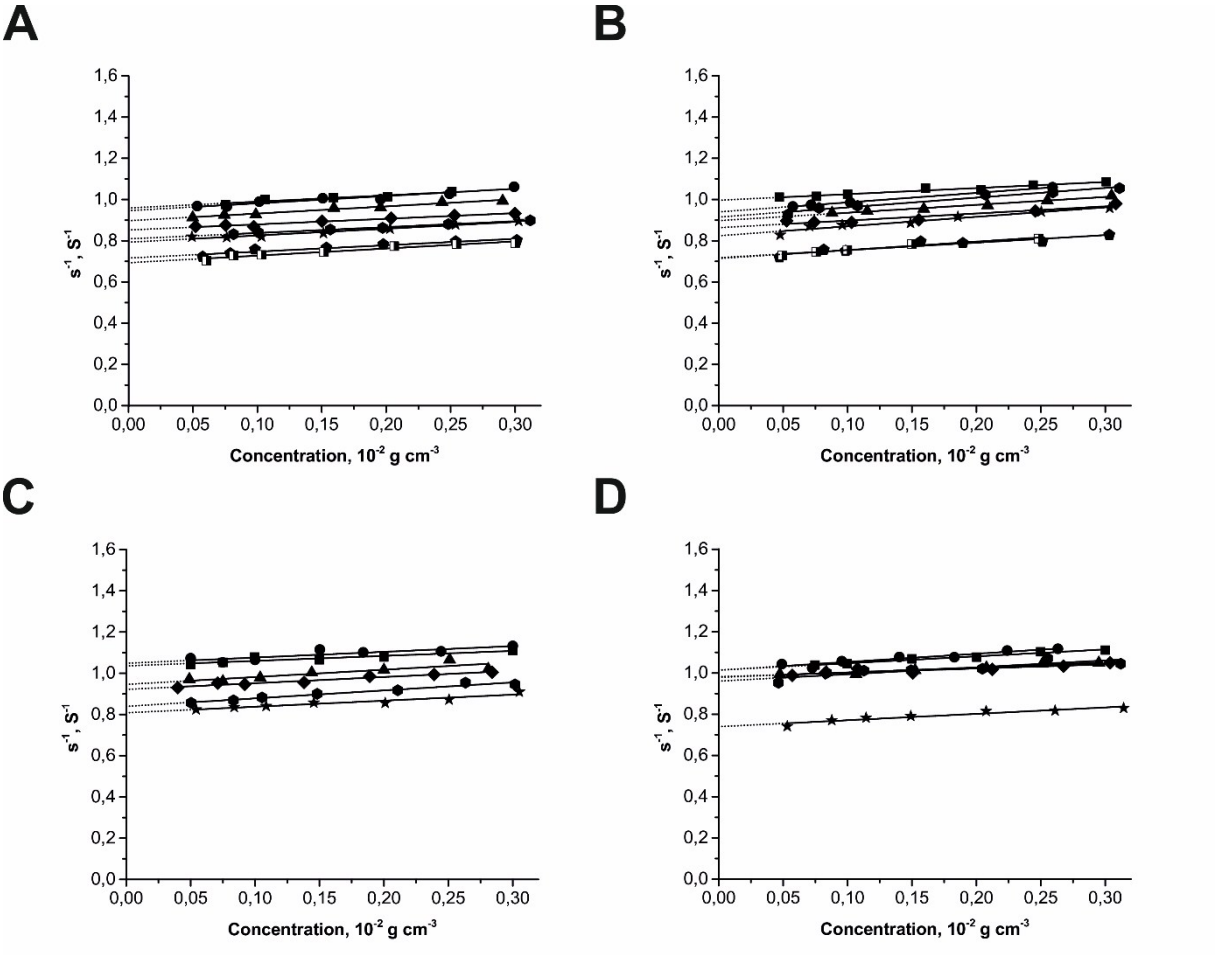


Figure S5. Plots of inverse sedimentation coefficients, s^{-1}, against macromolecule solution concentration with linear fits (solid lines) and extrapolations to zero concentration (dotted lines) to determine s_0 for of (A) statistical copolymers of HPMA and APMA, (B) the gradient copolymers of of HPMA and APMA, (C) the statistical copolymers of HPMA and GPMA, and (D) the gradient copolymers of HPMA and GPMA. Symbol assignment for polymers: **Squares** $HPMA_{95\%}$-s-$APMA_{5\%}$ $HPMA_{95\%}$-g-$APMA_{5\%}$ / $HPMA_{95\%}$-s-$GPMA_{5\%}$ / $HPMA_{95\%}$-g-$GPMA_{5\%}$; **circles** $HPMA_{90\%}$-s-$APMA_{10\%}$ / $HPMA_{90\%}$-g-$APMA_{10\%}$ / $HPMA_{90\%}$-s-$GPMA_{10\%}$ / $HPMA_{90\%}$-g-$GPMA_{10\%}$; **triangles** $HPMA_{80\%}$-s-$APMA_{20\%}$ / $HPMA_{80\%}$-g-$APMA_{20\%}$ / $HPMA_{80\%}$-s-$GPMA_{20\%}$ / $HPMA_{80\%}$-g-$GPMA_{20\%}$; **diamonds** $HPMA_{60\%}$-s-$APMA_{40\%}$ / $HPMA_{60\%}$-g-$APMA_{40\%}$ / $HPMA_{60\%}$-s-$GPMA_{40\%}$ / $HPMA_{60\%}$-g-$GPMA_{40\%}$; **hexagons** $HPMA_{50\%}$-s-$APMA_{50\%}$ / $HPMA_{50\%}$-g-$APMA_{50\%}$ / $HPMA_{50\%}$-s-$GPMA_{50\%}$ / $HPMA_{50\%}$-g-$GPMA_{50\%}$; **stars** $HPMA_{40\%}$-s-$APMA_{60\%}$ / $HPMA_{40\%}$-g-$APMA_{60\%}$; **pentagons** $HPMA_{25\%}$-s-$APMA_{75\%}$ / $HPMA_{25\%}$-g-$APMA_{75\%}$ / $HPMA_{25\%}$-s-$GPMA_{75\%}$ / $HPMA_{25\%}$-g-$GPMA_{75\%}$; **half-filled squares** $HPMA_{10\%}$-s-$APMA_{90\%}$ / $HPMA_{10\%}$-g-$APMA_{90\%}$ / $HPMA_{10\%}$-s-$GPMA_{90\%}$ / $HPMA_{10\%}$-g-$GPMA_{90\%}$.