Electronic Supplementary Information

Synthesis of mucoadhesive thiol-bearing microgels from 2-(acetylthio)ethylacrylate and 2-hydroxyethylmethacrylate: towards novel drug delivery systems for chemotherapeutic agents to the bladder

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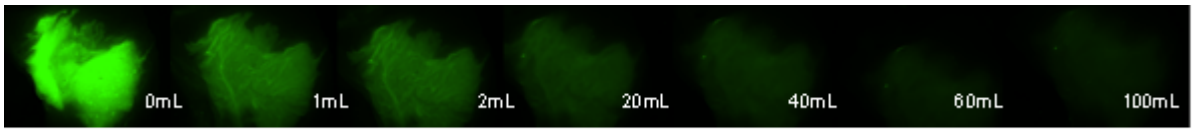

Fig. S1: Exemplar images showing wash-off of fluorescent microgels from porcine urinary bladder mucosa.

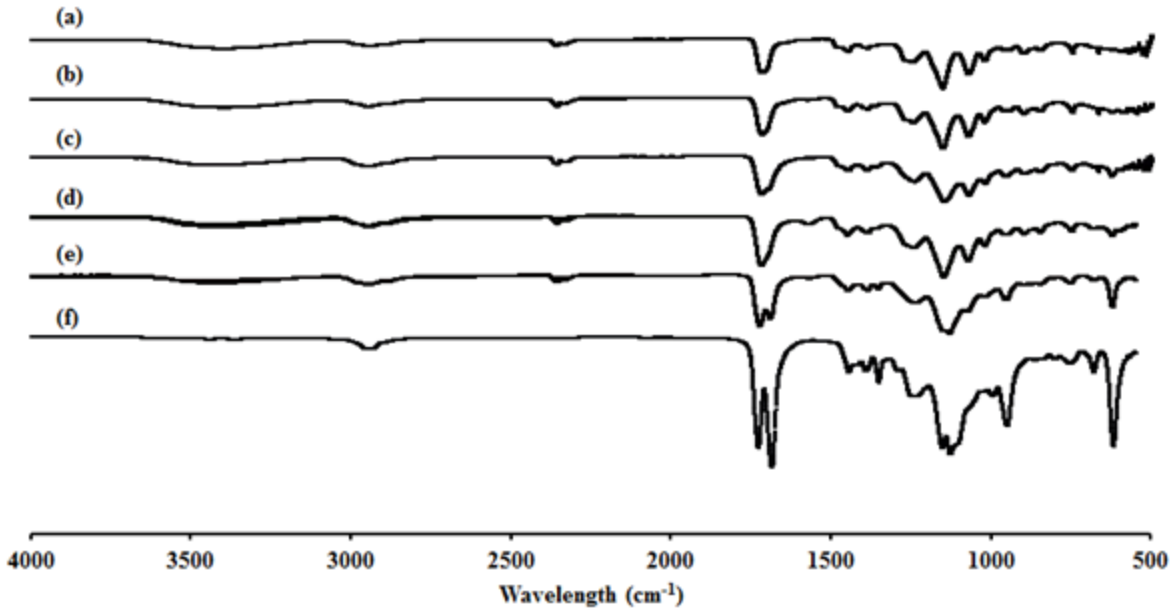

Fig. S2. IR spectra of ATEA:HEMA microgels: (a) 0, (b) 10, (c) 30, (d) 50, (e) 80 and (f) 100 mol% ATEA

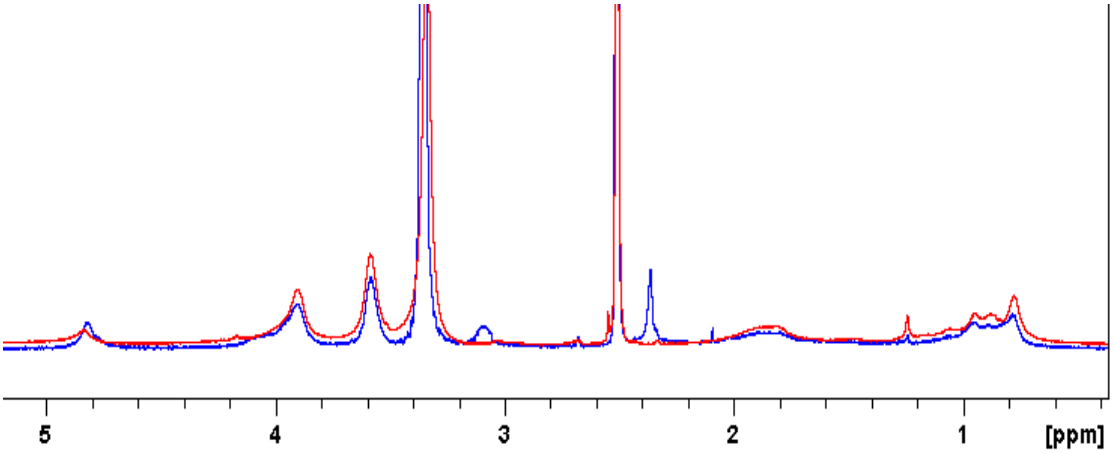

Fig. S3: NMR of 80 mol% ATEA microgels, before (blue) and after (red) deprotection with sodium thiomethoxide. Note the disappearance of the thioacetyl CH_3 peak at ~ 2.4 ppm and the appearance of an SH peak at ~1.25 ppm. This peak disappeared upon shaking with D_2O. During deprotection, the CH_2 protons adjacent to sulphur are shifted upfield, to become a shoulder on the DMSO-D_6 solvent peak.

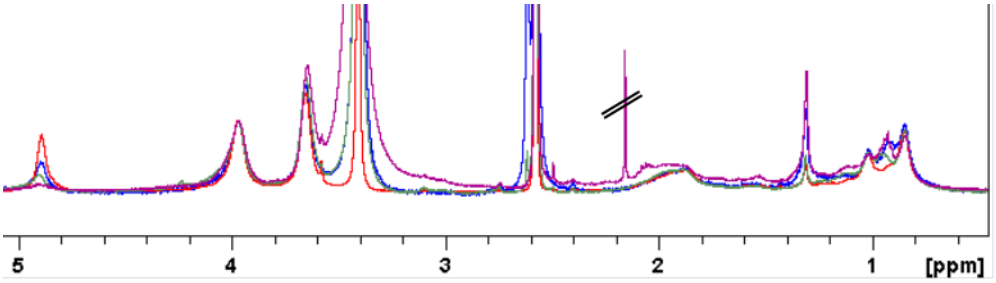

Figure S4: ^1H NMR spectra (DMSO-D_6) of 10 (red), 30 (blue), 50 (green), and 80 (purple) mol% ATEA microgels. The peak discarded at 2.09 ppm is residual acetone. Not the decreasing intensity of HEMA's OH proton at 4.9 ppm with increasing ATEA content.

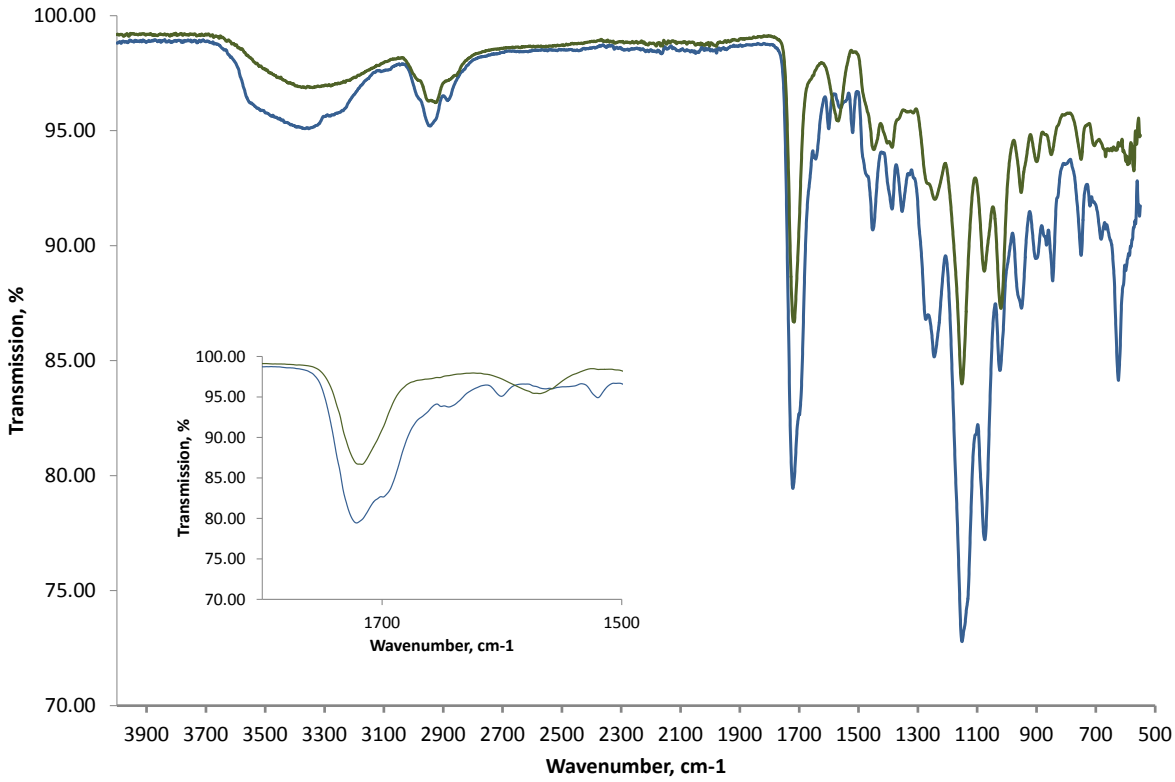

Fig. S5: Exemplar FTIR spectrum of 30% ATEA before (blue) and after (green) treatment with sodium thiomethoxide. Cleavage of acetate protecting group confirmed by loss of shoulder at 1690 cm^{-1}, corresponding to C=O stretch (expanded in insert), CH_3 bends at 1520 and 1350 cm^{-1}, and C-S stretch at 622 cm^{-1}. Stretch at 1568 cm^{-1} arises from thiolate anion, consistent with Montero-Rama et al.[12]

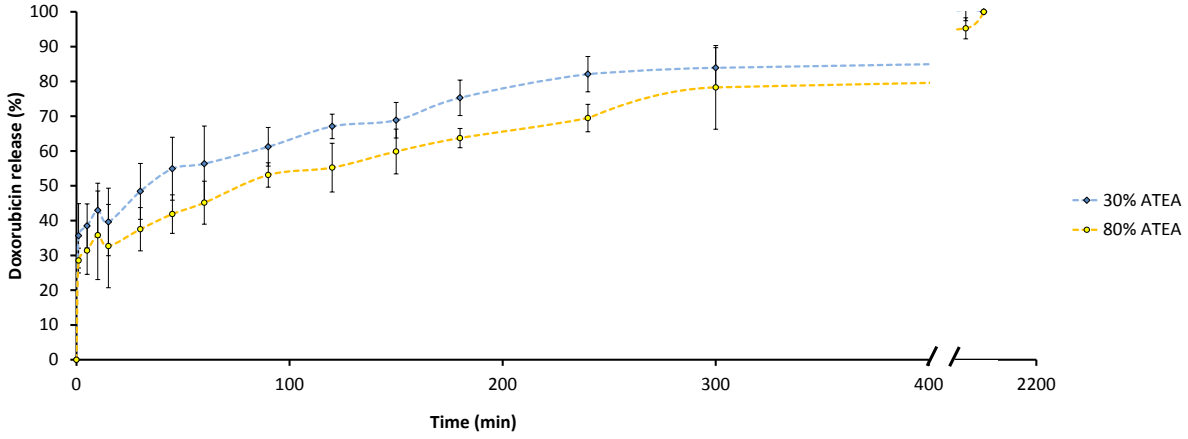

Fig. S6: Drug release from 30 mol% (blue) and 80 mol% ATEA (yellow) microgels, expressed as % drug release.

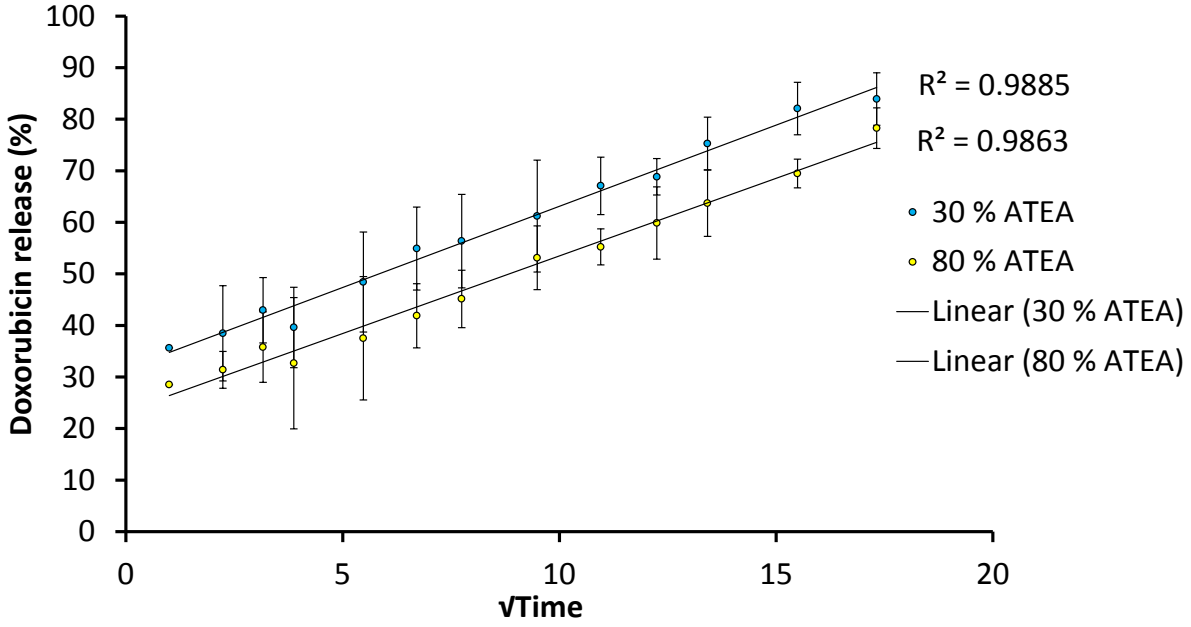

Fig. S7: Fitting of Higuchi equation to release data

Table S1 Feed mixtures for each copolymer polymerization

ATEA content (mol%)	HEMA (mg)	ATEA (mg)	EGDMA (mg)
0	1000	0	100
10	870	130	100
30	634	366	100
50	428	572	100
80	157	843	100
100	0	1000	100

Table S2 Doxorubicin hydrochloride loading into microgels.

ATEA content (mol%)	Encapsulation efficiency (%)	Drug loading (%)	Equivalent therapeutic dose (mg/mL)
30	75 ± 15	37 ± 5	2.5 ± 1.0
80	86 ± 8	40 ± 4	2.7 ± 1.4

Equation S1:

$$Encapsulation\ efficiency = 100\ \times \frac{Cmax - Csup}{Cmax}$$

Where Cmax is the total mass of doxorubicin added to the microgel suspension, and Csup is the mass of doxorubicin in the supernatant after centrifugation (i.e. the unloaded doxorubicin).

Equation S2

$$Drug\ loading = 100\ \times \frac{Mass\ of\ doxorubicin\ in\ microgels}{Mass\ of\ doxorubicin\ in\ microgels + mass\ of\ microgels}$$

Where the mass of doxorubicin can be calculated from the encapsulation efficiency multiplied by the Cmax. Cmax in these experiments was 780 µg; and the mass of microgels used was 1 mg.