# Supporting information

Synthesis and Mass Cytometric Analysis of Lanthanide-encoded Polyelectrolyte Microgels

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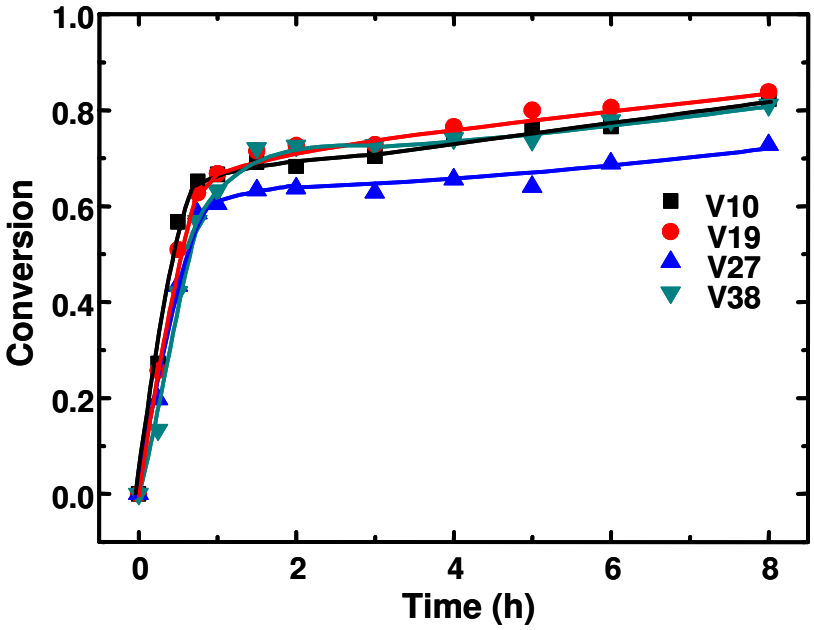
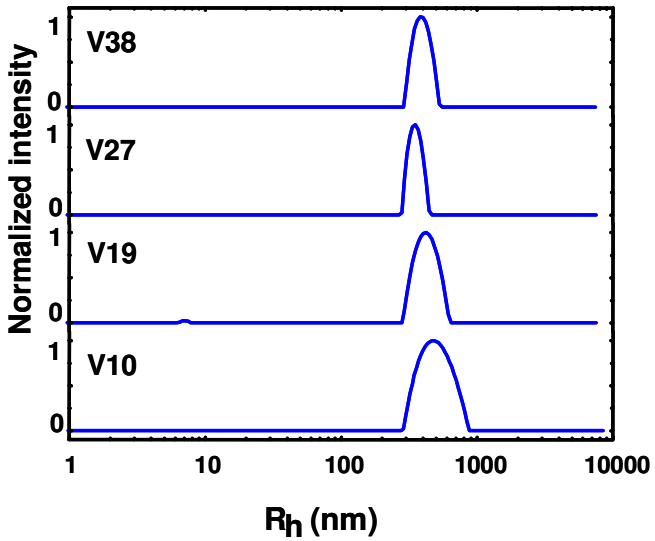



Figure S1. Kinetics study: formation of Poly(NIPAm/VCL/MAA) microgels with MAA feed ratio ranging from 10 mol % to 38 mol %. The notation indicates the comonomer (V = VCL) and the number indicates the mole fraction of MAA in the reaction.

a)

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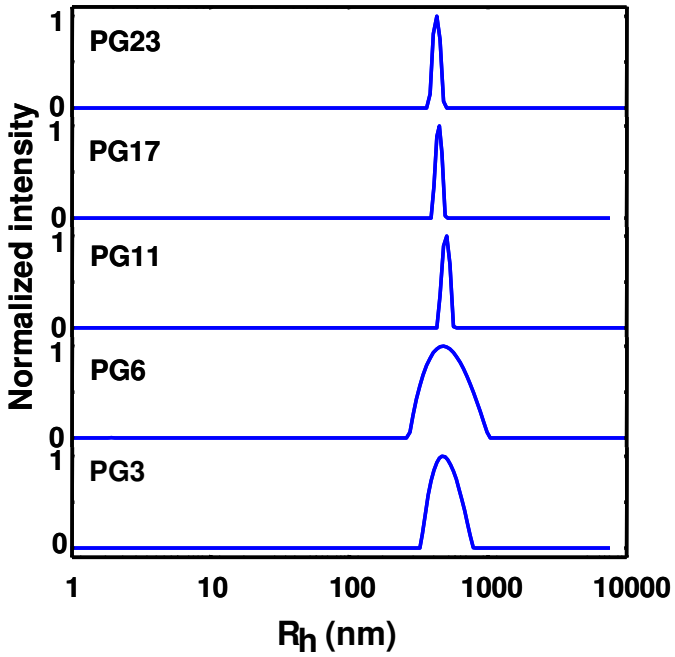
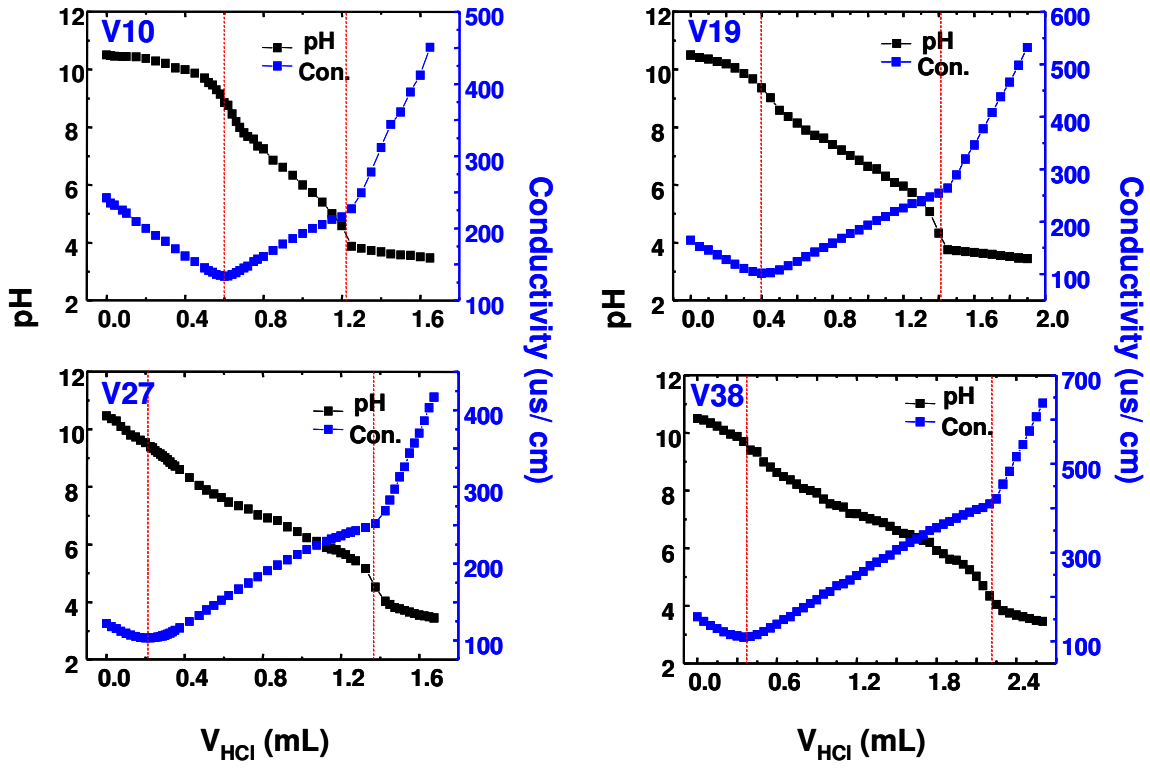



Figure S2. CONTIN plots of the DLS data: (a) poly(NIPAm/VCL/MAA) microgels with MAA feed ratio ranging from 10 mol % to 38 mol %. (b) poly(NIPAm/MAA/PEGMA) microgels with MAA feed ratio ranging from 3 mol% to 23 mol %. The notation indicates the comonomer (V = VCL, PG = PEGMA) and the number indicates the mole fraction of MAA in the reaction.

a)


V10
pH
Con.
V19
pH
Con.
V27
pH
Con.
V38
pH
Con.
pH
Conductivity (us/ cm)
$V_{HCl}$ (mL)

b)

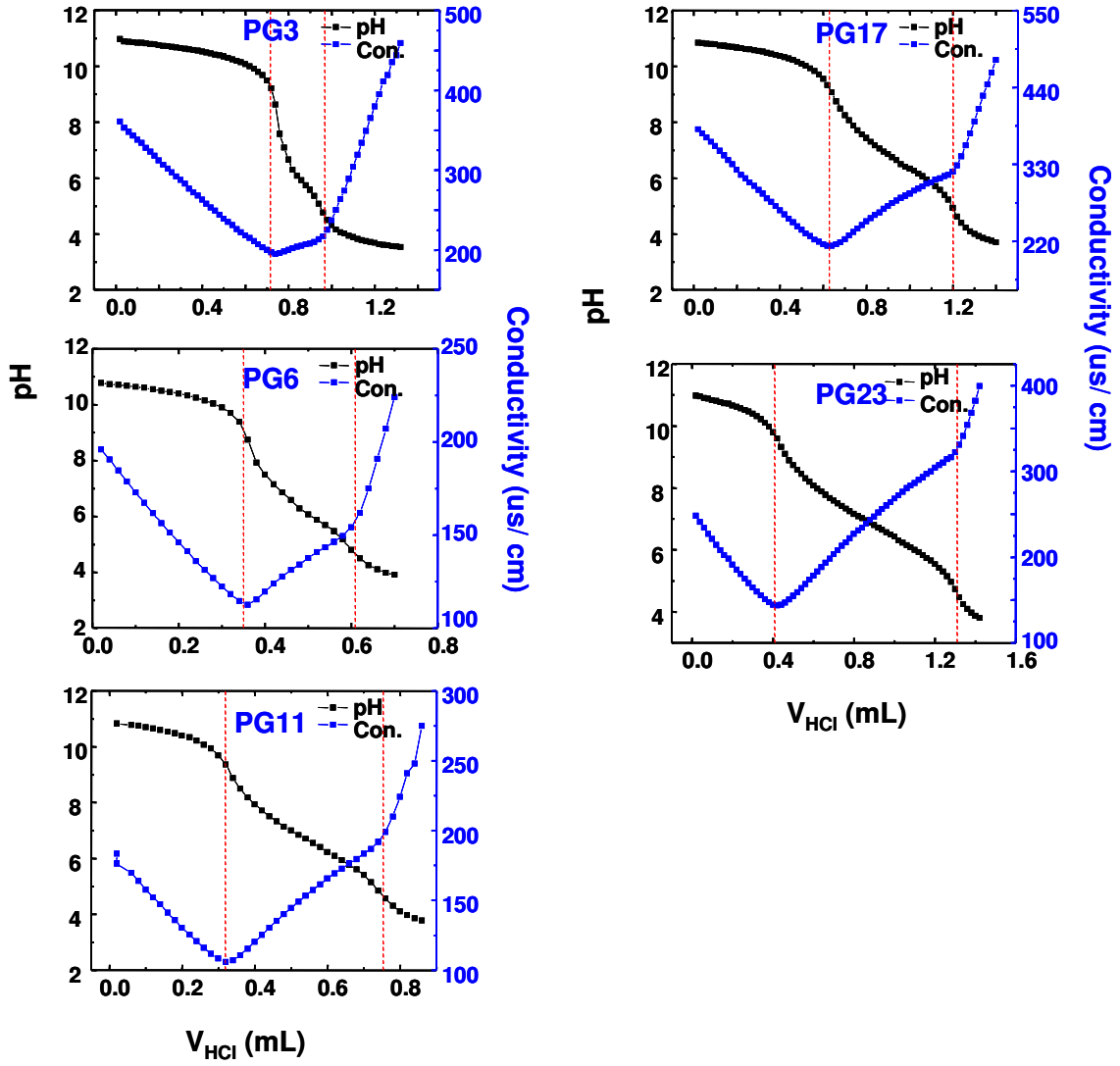
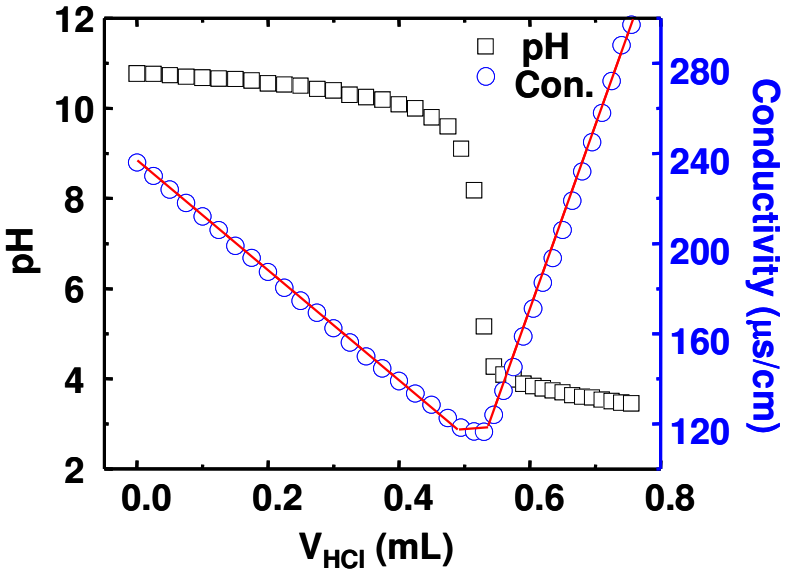



Figure S3. pH and conductometric titration curves: (a) poly(NIPAm/VCL/MAA) microgels with MAA feed ratios ranging from 10 mol % to 38 mol %. (b) poly(NIPAm/MAA/PEGMA) microgels with MAA feed ratios ranging from 3 mol% to 23 mol %. The notation indicates the comonomer (V = VCL, PG = PEGMA) and the number indicates the mole fraction of MAA in the reaction.

a)




b)

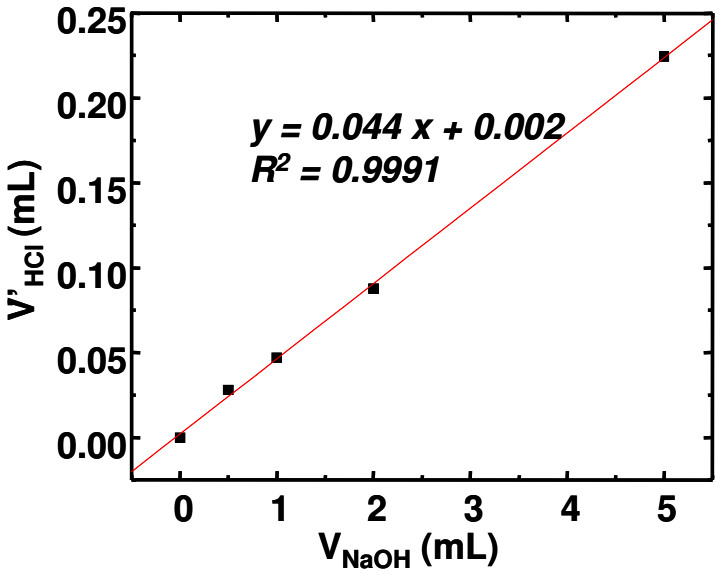
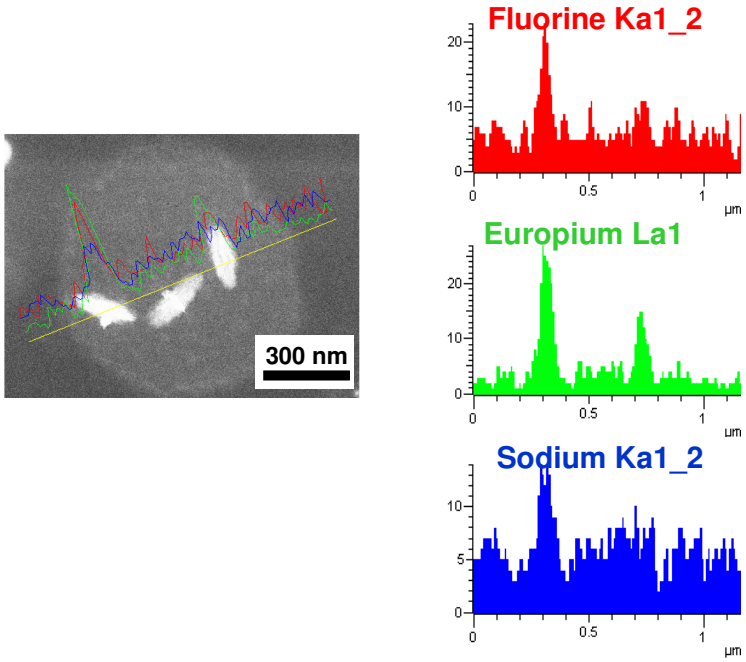



Figure S4. pH and conductometric titration for blank solution: (a) a blank titration with 0.2 mmol of NaOH in 50 mL of DI water (b) A plot of the calculated volume of HCl needed to titrate the $HCO_3^-$ ions formed by $CO_2$ from the air against the volume of 0.1 N NaOH solution injected before titration.

a)




b)

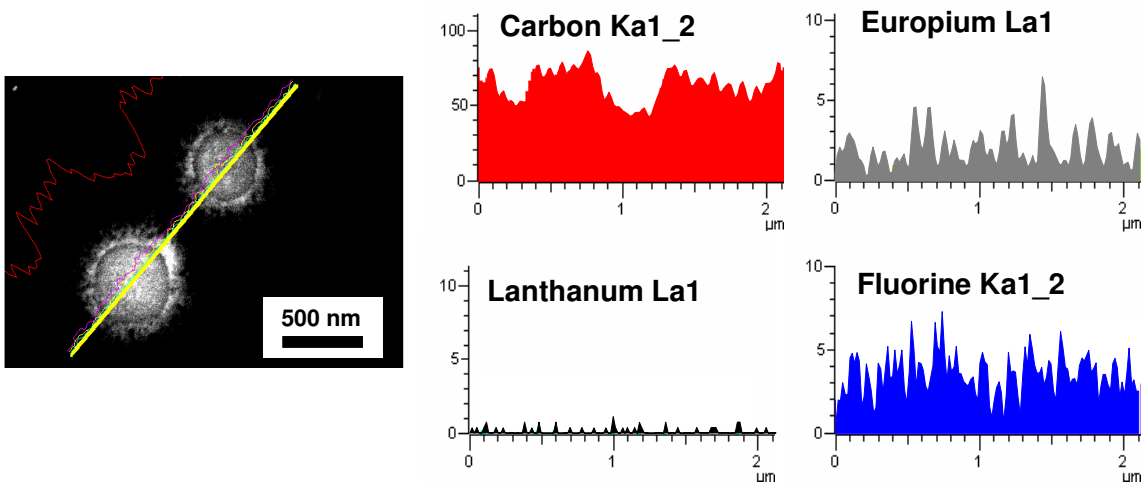



Figure S5. Elemental analysis by EDX: (a) linear scan of V27 microgel containing EuF3 NPs on the surface obtained from pH 6 solution; (b) linear scan of P17 microgels containing $EuF_3$ NPs inside, obtained from microgels neutralized with 1 eqv. of NaOH and then ion exchanged with $EuCl_3$.

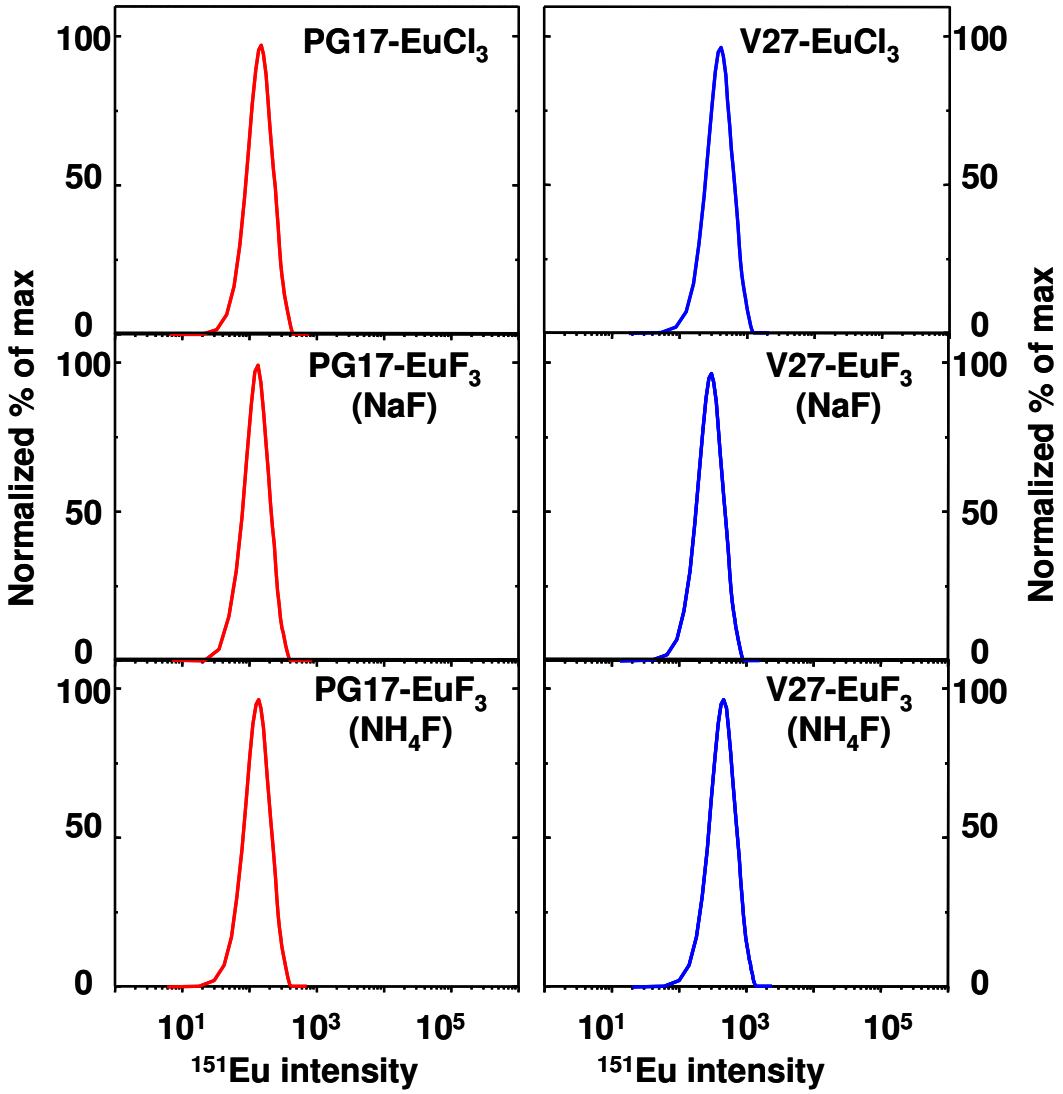



Figure S6. Histograms of Eu signal distribution determined by mass cytometry.

Table S1. Recipes and dimensions of poly(NIPAm/VCL) microgels prepared under surfactant-free conditions [a]

| Samples | NIPAm mmol | VCL mmol | BIS mmol | NIPAm / VCL | $R_h$ / 20 $^oC$ nm | PDI |
|---|---|---|---|---|---|---|
| 1 | 0.55 | 5.45 | 0.18 | 1 : 10 | 620 | 0.05 |
| 2 | 1.24 | 4.50 | 0.18 | 1 : 4 | 470 | 0.11 |
| 3 | 2.00 | 4.00 | 0.18 | 1 : 2 | 470 | 0.18 |
| 4 | 3.00 | 3.00 | 0.18 | 1 : 1 | 470 | 0.09 |
| 5 | 4.00 | 2.00 | 0.18 | 2 : 1 | 480 | 0.07 |
| 6 | 4.80 | 1.20 | 0.18 | 4 : 1 | 410 | 0.01 |

a. NIPAm, VCL and BIS were dissolved in 48 mL of DI water. The mixture was kept in a 100 mL three-necked flask and stirred under $N_2$ flow for 30 min. The polymerization was initiated with 60 mmol of V-50 (in 2 mL of DI water) at 70 $^oC$. The reaction mixture became turbid, and the reaction was continued for 8 h.