Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Stimuli responsive polyphosphazene-based molecular gates for controlled drug delivery in lung cancer cells

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Synthesis and characterization of the Jeffamine-based polyphosphazene (PPz)

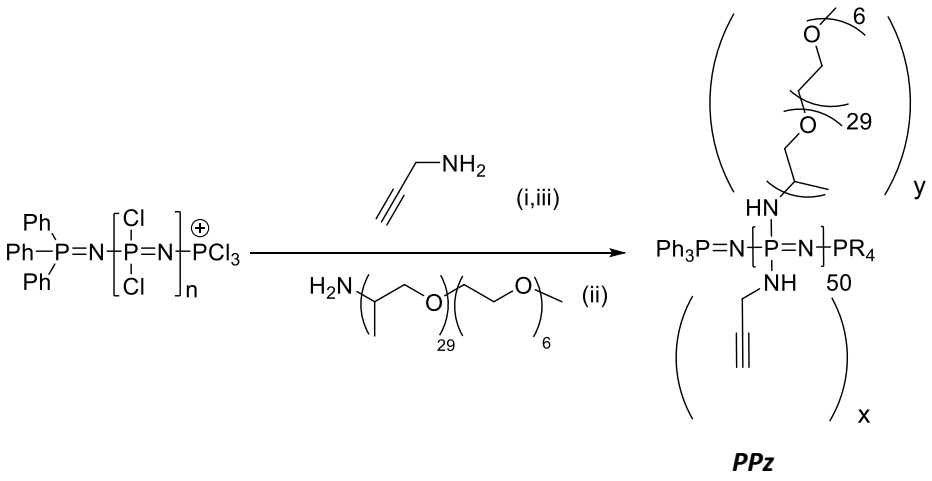

Figure SI-1. Synthesis reaction of Jeffamine-based polyphosphazene (PPz) by macromolecular substitution carried out in three steps: (i) adding propynylamine, then (ii) Jeffamine M-2005 and finally (iii) an excess of propargylamine, n ~ 50. The scheme of the polymer shows combinations of the two different substituents statistically distributed along the backbone in a ratio of propynylamine:Jeffamine M-2005 approximately 2:1 (x = 1.4 and y = 0.6).

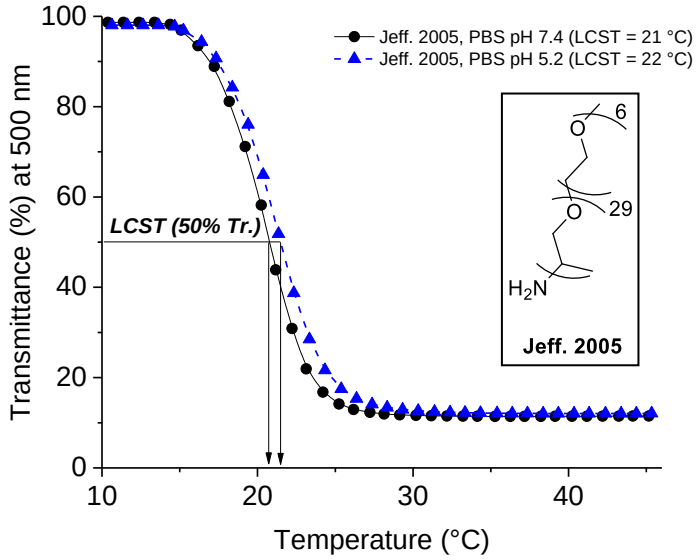

Figure SI-2. Lower critical solution temperature (LCST) of Jeffamine M-2005 (Jeff. 2005) determined by transmittance measurements with increasing temperature at 500 nm for 1 mg mL^{-1} of polymer, as purchased, in phosphate buffer solution at pH 7.4 and 5.2. Inset: chemical structure of the polymer.

Characterization of the hybrid nanomaterials:

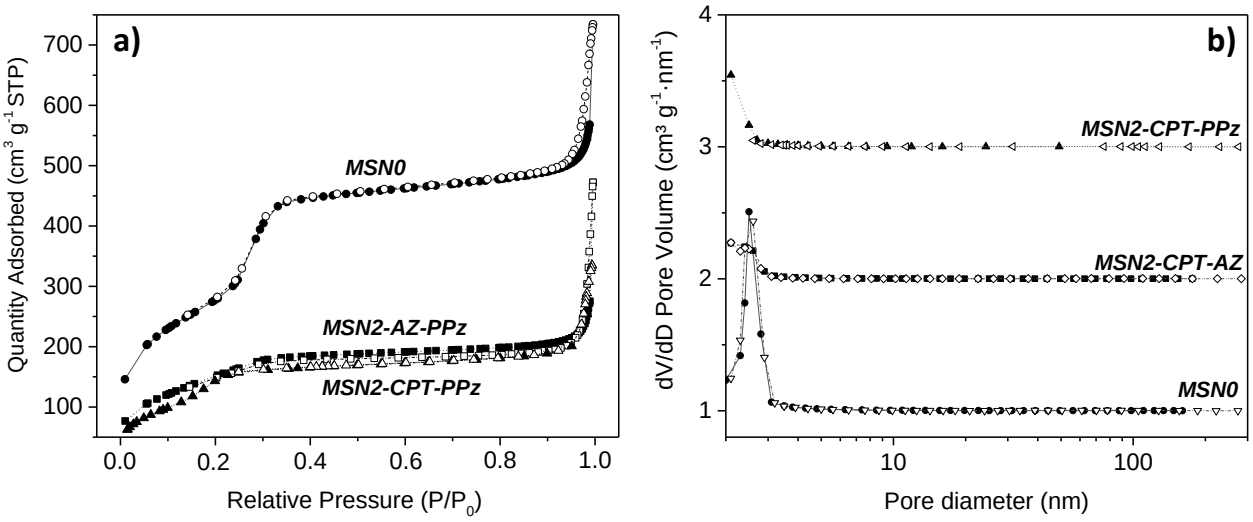

Figure SI-3. a) Nitrogen adsorption-desorption isotherms and b) BJH pore size distribution curves of materials **MSN0**, **MSN2-CPT-AZ** and **MSN2-CPT-PPz**, full symbols and empty symbols stand for adsorption and desorption respectively.

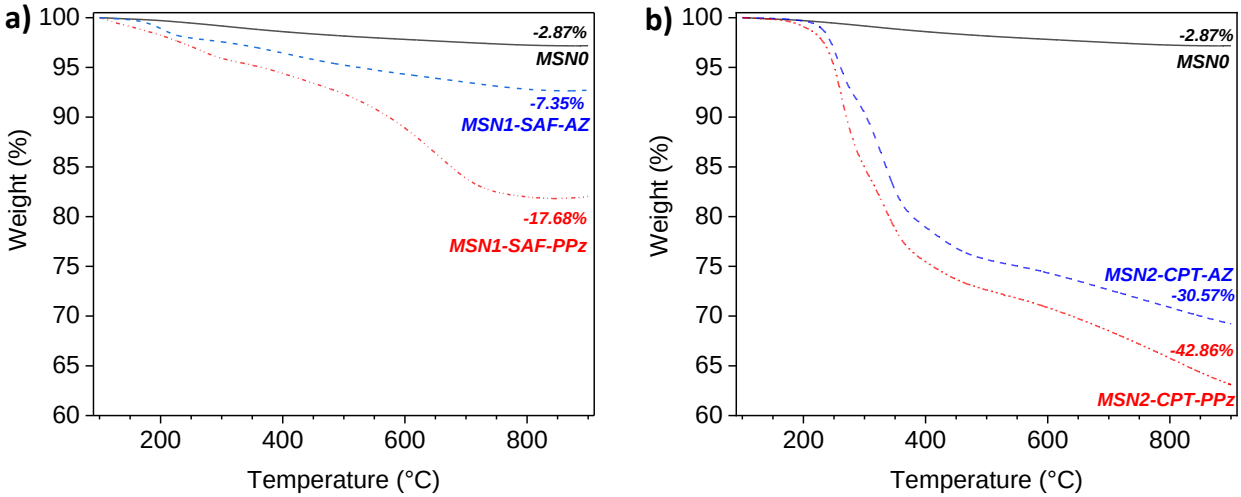

Figure SI-4. Thermogravimetric analysis of all prepared nanomaterials **MSN0**, **MSN1-SAF-AZ**, **MSN1-SAF-PPz**, **MSN2-CPT-AZ** and **MSN2-CPT-PPz**

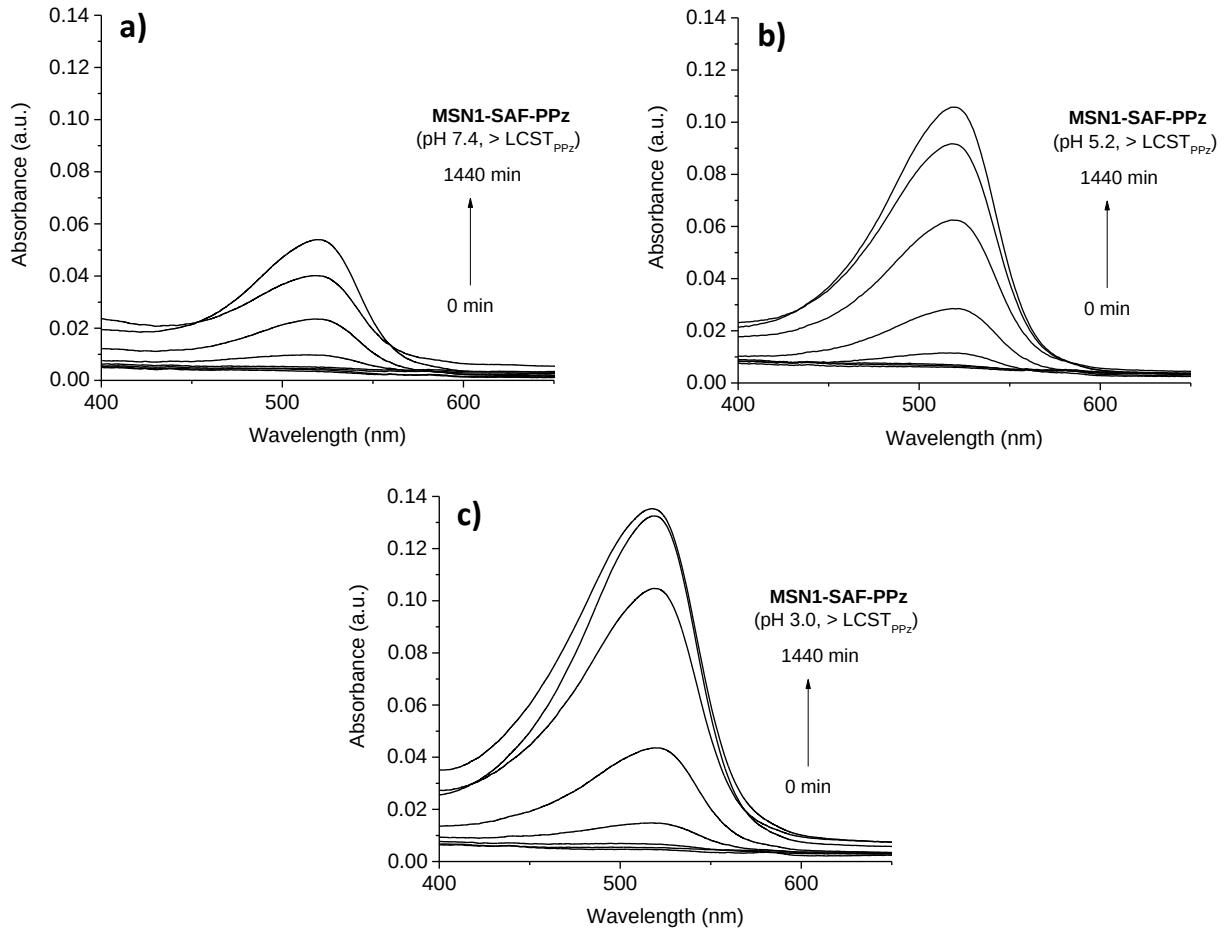

Figure SI-5. UV-Vis spectra of the released safranin O in from the collapsed PPz-capped MSNs (MSN1-SAF-PPz) at pH 7.4 (a), 5.2 (b) and 3.0 (c) during 1440 min at 37 °C (above LCST$_{PPZ}$).

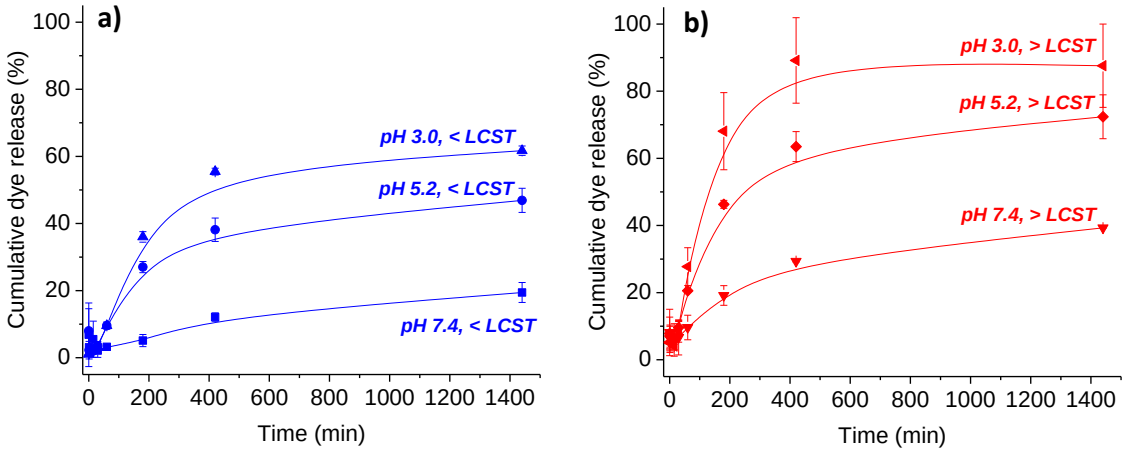

Figure SI-6. Cumulative dye release (%) of Safranin O at 520 nm in aqueous buffered suspensions from PPz-capped mesoporous silica nanoparticles (MSN1-SAF-PPz) at pH 7.4, 5.2 and 3.0 during 1440 min, at a) temperature below and b) above LCST$_{PPz}$ (at 5 °C and 37 °C, respectively).

Cell uptake studies of nanoparticles

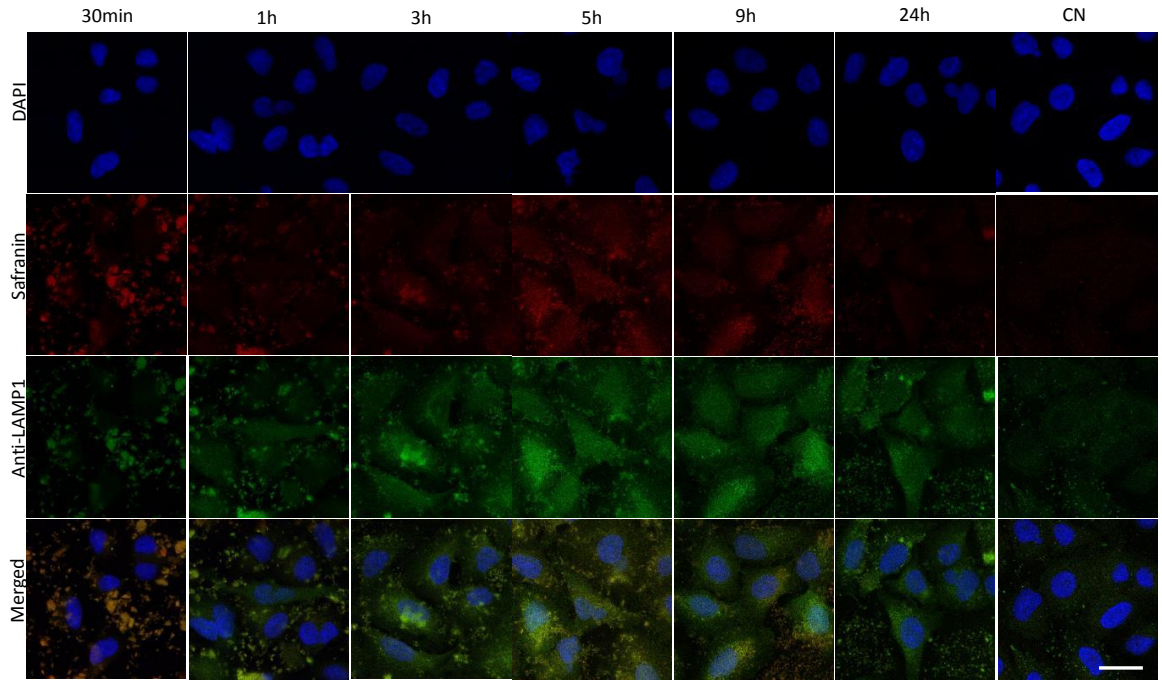

Figure SI-7. Accumulation of the dye safranin O in A549 lung adenocarcinoma cells after different time incubation of cells with nanoparticles loaded with safranin. In addition, nuclei were stained (DAPI), as well as lysosomes (anti-LAMP1 antibody), and all signals were co-localized (merged). Scale bar = 25 μm.

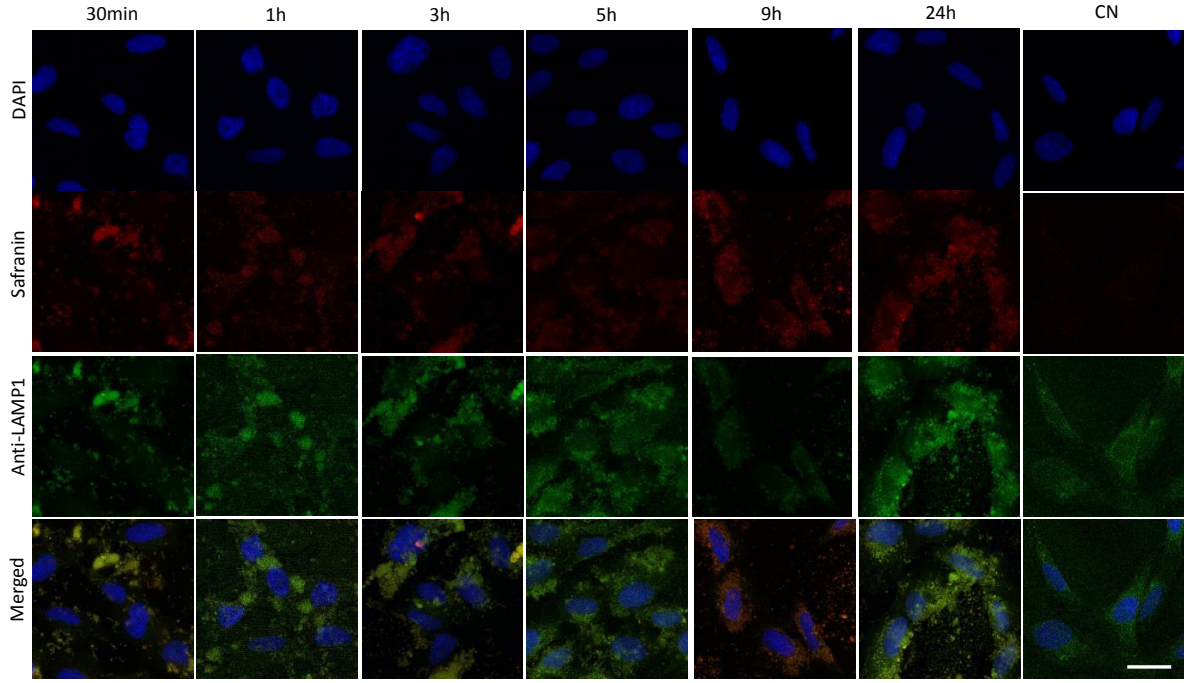

Figure SI-8. Accumulation of the dye safranin O in BEAS-2B lung epithelial cells after different time incubation of cells with nanoparticles loaded with safranin. In addition, nuclei were stained (DAPI), as well as lysosomes (anti-LAMP1 antibody), and all signals were co-localized (merged). Scale bar = 25 μm.