Supporting Information

pH-sensitive poly(ethylene glycol) / poly(ethoxyethyl glycidyl ether) block copolymers: synthesis, characterization, encapsulation and delivery of a hydrophobic drug

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Flory-Huggins parameter calculation

Curcumin-copolymer hydrophobic block compatibility (Table 1) was calculated using the Hildebrand-Scatchard equation.

$$\chi_{curcumin-polymer} = \left(\delta_{curcumin} - \delta_{polymer}\right)^2 \times \frac{V}{R.T}$$

Where

$\chi_{curcumin-polymer}$ is the Flory-Huggins interaction parameter

$\delta_{curcumin}$ is the solubility parameter for the drug.

$\delta_{polymer}$ is the solubility parameter for the hydrophobic block of the copolymer.

R is the gas constant.

T= 310 K.

V is the molar volume of curcumin (253.1 $cm^3.mol^{-1}$) calculated by the additive group contributions method according to Fedors.[1]

Solubility parameters were calculated using Van Krevelen's additive group contribution method.[2]

$$\delta^2 = \delta_d^2 + \delta_p^2 + \delta_h^2$$

Where

$\delta_d = \frac{\sum F_{di}}{V}$ is the dispersion component.

$\delta_p = \frac{\left(\sum F_{pi}^2\right)^{1/2}}{V}$ is the polar component.

$\delta_h = \left(\sum \frac{E_{hi}}{V}\right)^{1/2}$ is the hydrogen binding component.

Where

F_{di}, F_{pi}, and E_{hi} are the molar dispersion, polar attraction constants, and hydrogen bonding energy for each structural group of the polymer repeating unit. V is the molar mass of the repeating unit. Values for these parameters were found in tables published by Van Krevelen.[2]

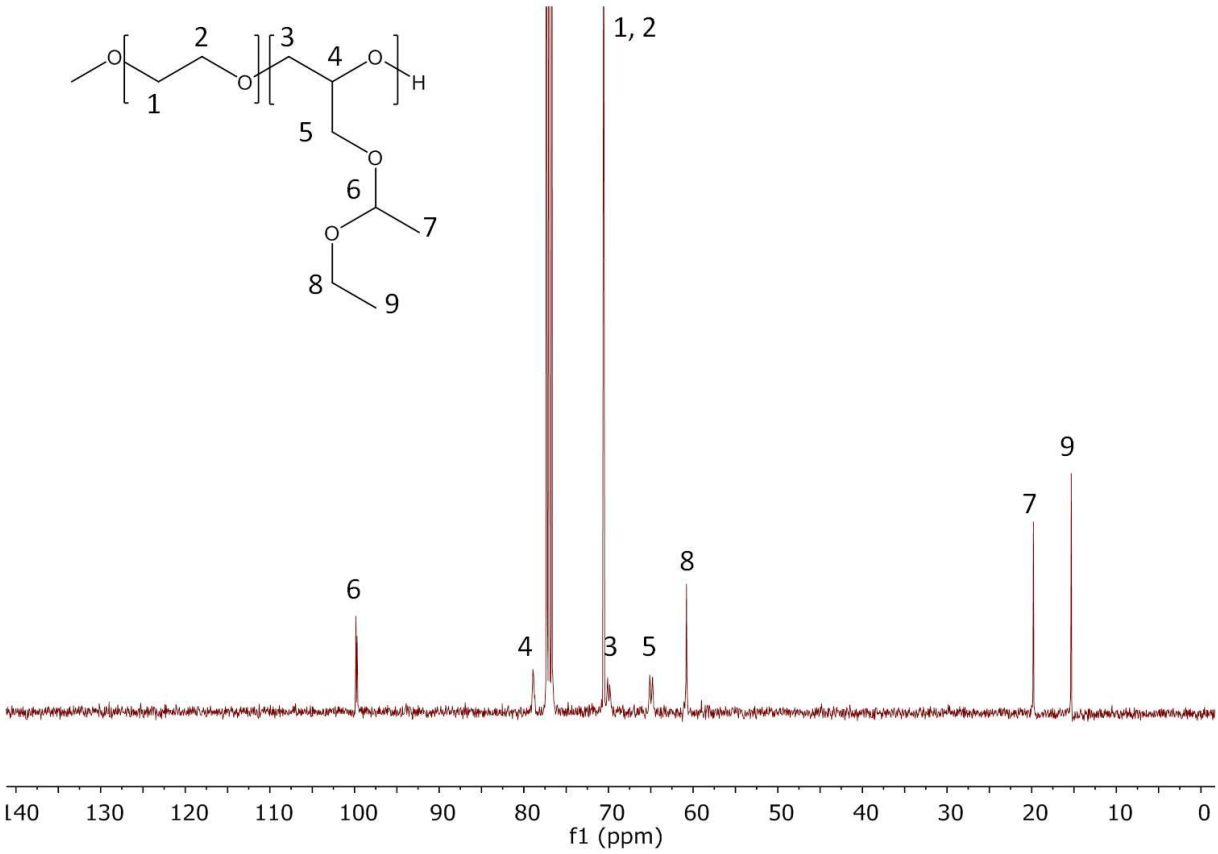

Figure S1. ^{13}C NMR spectrum of $mPEG_{40}$-b-$PEEGE_{25}$ (Table 2 run 3) in $CDCl_3$.

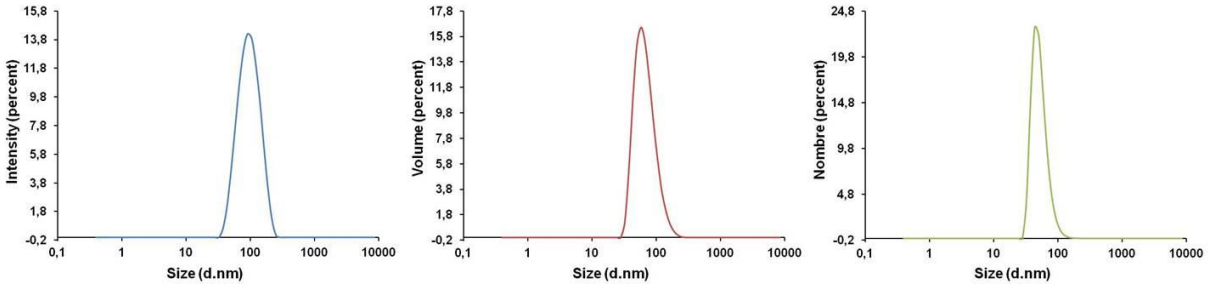

Figure S2. DLS plots of micelles formed by self-assembling of $mPEG_{40}$-b-$PEEGE_{25}$ in deionized water after 1 hour at 0.1 $mg.mL^{-1}$.

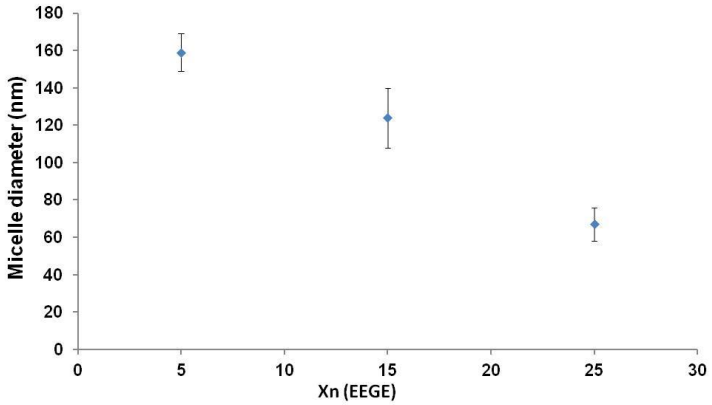

Figure S3. Average values of the average hydrodynamic diameters in deionized water determined by DLS at 0.1 mg.mL^{-1} according to the polymerization degree of the hydrophobic block.

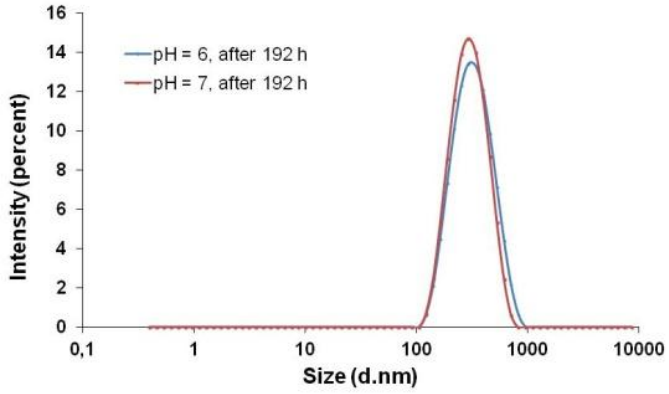

Figure S4. DLS plots (particle size distributions in intensity) of unloaded micelles formed by self-assembling of mPEG$_{40}$-PEEGE$_{25}$ (0.1 mg.mL^{-1}) in phosphate buffer (pH = 6.4 and 7.2) measured after 192 h at 25°C.

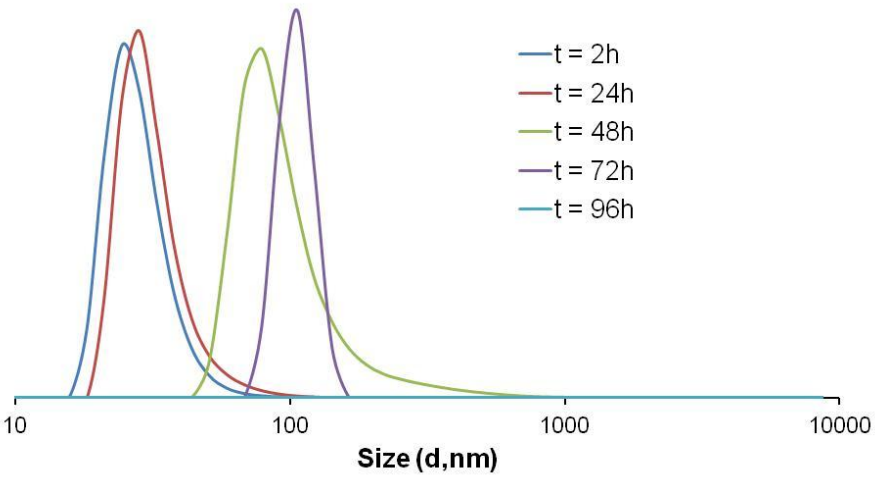

Figure S5. DLS plots (particle size distributions in number) of unloaded micelles formed by self-assembly of mPEG$_{40}$-b-PEEGE$_{25}$ (0.1 mg.mL^{-1}) in pH 5.3 phosphate buffer measured over time at 37°C.

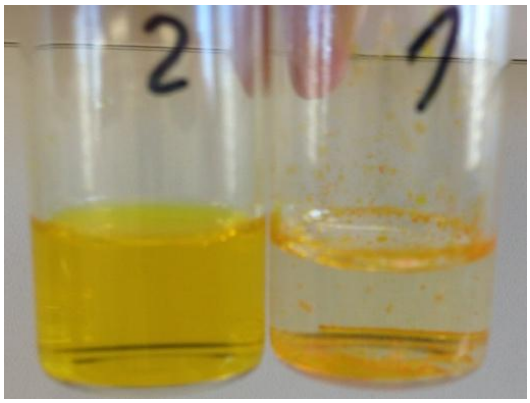

Figure S6. 1) curcumin in phosphate buffer (right); 2) curcumin encapsulated in $mPEG_{40}$-b-$PEEGE_{25}$ micelles (left).

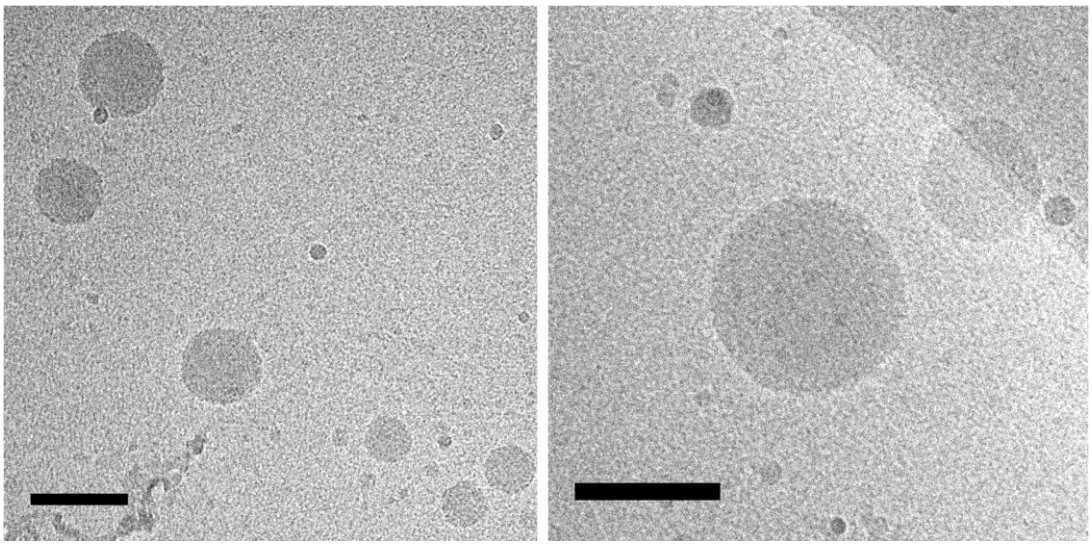

Figure S7. Morphology of curcumin containing $mPEG_{40}$-b-$PEEGE_{25}$ micelles in water (5 $mg.mL^{-1}$) by cryo-TEM. Scale bar is 100 nm.

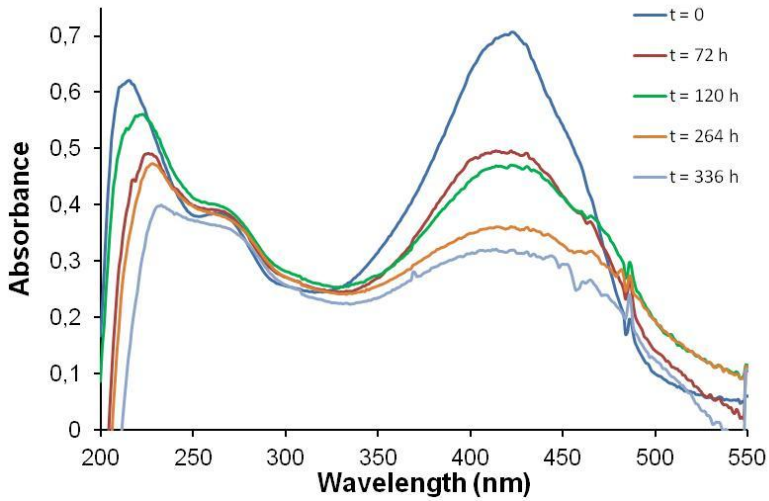

Figure S8. UV-visible spectra of colloidal solution of curcumin in $mPEG_{40}$-b-$PEEGE_{25}$ micelles in phosphate buffer pH 5.3.

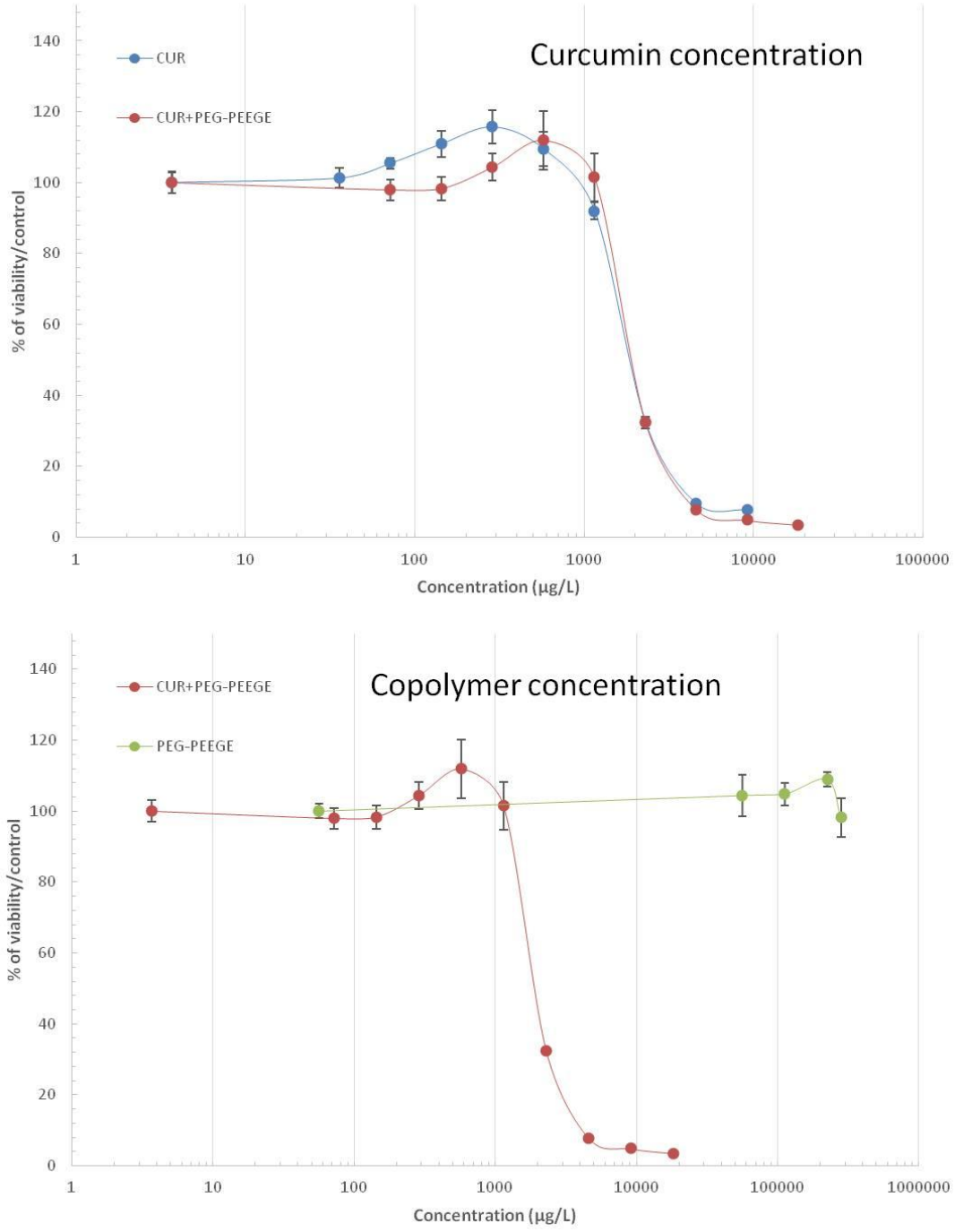

Figure S9. Dose-response curves of curcumin, PEG_{40}-b-$PEEGE_{25}$ and curcumin-containing nanoparticles in MDA-MB-231 cells obtained by MTT assay.

References

[1] R. F. Fedors, *Polymer Engineering & Science* **1974**, *14*, 147.
[2] D. W. Van Krevelen, "*Properties of Polymers: Their Correlation with Chemical Structure; Their Numerical Estimation and Prediction from Additive Group Contributions*", 2009, p. 1.