Electronic supplementary information (ESI) for Soft Matter

Novel Shell-Cross-Linked Micelles with Detachable PEG Corona for Glutathione-mediated Intracellular Drug Delivery

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Synthesis of carboxymethyl *m*PEG (*m*PEG-COOH)

An aqueous solution of KOH (40 wt%, 20 mL) was added to a solution of *m*PEG (5 g, 1 mM) in 30 mL of dimethylsulfoxide (DMSO). The solution was kept under magnetic stirring at room temperature for 30 min. Bromoacetic acid (1.38 g, 10 mM) was then added and the solution was kept at 70 ^{o}C for an additional 24 h. when the reaction was finished, a 38% HCl aqueous solution was added to neutralize the mixture. After successive removal of the resultant KCl and the solvents, the residue was dissolved in CH_2Cl_2 and precipitated with excessive ethyl ether. The precipitate (*m*PEG-COOH) was collected and dried under vacuum overnight.

Synthesis of cystamine-modified *m*PEG(PEG-SS-NH_2)

*m*PEG-COOH (2.5 g, 0.5 mM), DCC (0.15 g, 0.75 mM)and NHS (0.86 g, 0.75 mM)was dissolved in 40mL THF. The reaction mixture was stirred for 8h and then added dropwise to a solution of cystamine(0.76 g, 5 mM) in 60 mL THF. The solution was allowed to stir for additional 24 hours at room temperature. The organic phase was concentrated and added dropwise to excessive ethyl ether to precipitate the product. The precipitate was collected by filtration and dried under vacuum overnight.

FT-IR measurements, ^{1}H NMR characterization and GPC measurements

FT-IR spectra were recorded on an Avatar 360 spectrometer. ^{1}H NMR spectra were recorded on a Mercury VX-300 spectrometer at 300 Hz using CF_3COOD-d6 as the solvent. Number-average molecular weights (*M*n) of PEG-SS-PLys-PLeu were determined by gel permeation chromatographic (GPC) system equipped with Waters 2690D separations module, Waters 2410 refractive index detector. DMF was used as the eluent at a flow rate of 0.3 $mLmin^{-1}$. Waters millennium module software was used to calculate molecular weight on the basis of a universal calibration curve generated by narrow molecular weight distribution polystyrene standards.

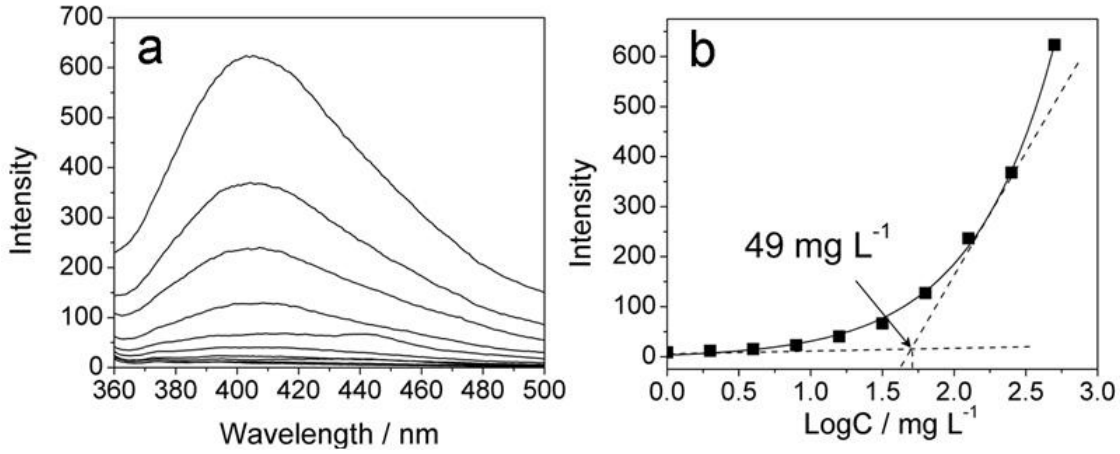
Fluorescence measurements, TEM, SEM measurements and size distribution measurements

Fluorescence spectra were recorded on a Hitachi F2500 luminescence spectrometer. A drop of the micelle suspension containing 0.01% (w/v) phosphotungstic acid was placed on a copper grid with Formvar film and dried at 25 ^{o}C before being analyzed by JEM-100CX II instrument operating at an acceleration voltage of 100 kV. Scanning electron micrograph (SEM) was taken with a FEI-QUANTA 200 microscope. Malvern Nano-ZS ZEN3600 was used to determine the size distribution of the self-assembled micelles.

Supplementary Table 1. Feed ratio and molecular weight of synthesized PEG-SS-PLys(Z)-PLeu.

Polymer	PEG/Lys-NCA/Leu-NCA feed weight ratio	Reaction time (h)	M_n [a]	M_n [b]
P1	5/3/4	72	7000	9800
P2	5/3/2	72	6200	8500

[a] Calculated from GPC, [b] Calculated from ^{1}H NMR spectra.



Supplementary Figure 1. (a) Emission spectra of pyrene with different concentrations of polymer 1; (b) Intensity of the emission spectra at 410 nm as a function of the logarithm of polymer concentration.