Electronic Supplementary Material (ESI) for Polymer Chemistry

Redox-Sensitive Shell Cross-linked PEG-Polypeptide Hybrid Micelles for Controlled Drug Release

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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 Trifluoroacetic acid-d as the solvent. Number-average molecular weights (*M*n) of *m*PEG 5000 and PEG-PCys(Z)-PPhe 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 mL min^{-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.

Characterizations of micelles

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. Fluorescence spectra were recorded on a Hitachi F2500 luminescence

spectrometer. Malvern Nano-ZS ZEN3600 was used to determine the size distribution of the self-assembled micelles. All the samples were prepared at the concentration of 0.3 mg mL^{-1}.

In vitro cytotoxicity study

The cells were cultured in the medium DMEM supplemented with 10 % fetal bovine serum and 0.1 % penicillin-streptomycin. HeLa cells and 293T cells were seeded in 96-well plates (5×10^3 cells per well in 100 μL culture medium) for 24 h. Then the cultured medium was replaced by DMEM containing the PEG-PCys- PPhe copolymers with varying concentrations. After the cells incubated at 37 ºC in 5 % CO_2 atmosphere for 48 h, DMEM with the polymer was replaced by fresh DMEM, and 20 μL of MTT solution (5 mg mL^{-1}) was added to the cells. After incubation for 4 h, 150 μL of DMSO was added and shaken at room temperature. The optical density (OD) was measured at 492 nm with Multiscan MK3 (Thermo Fisher Scientific, Waltham, MA, USA). The cell viability was calculated using Equation

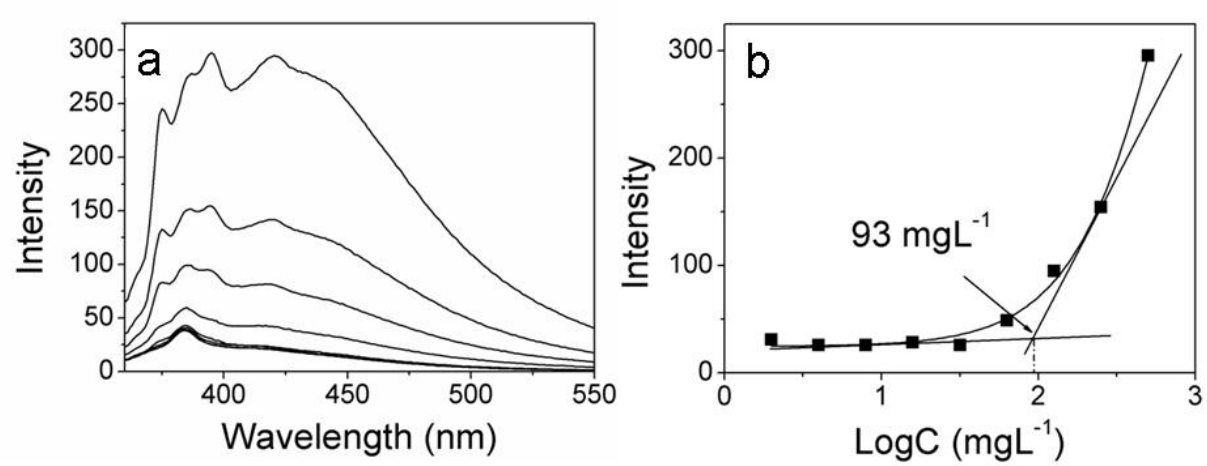
$$\text{Cell viability (\%)} = (OD_{treated}/OD_{control})\times100\%,$$

where $OD_{control}$ was obtained in the absence of polymer and $OD_{treated}$ was obtained in the presence of polymer.

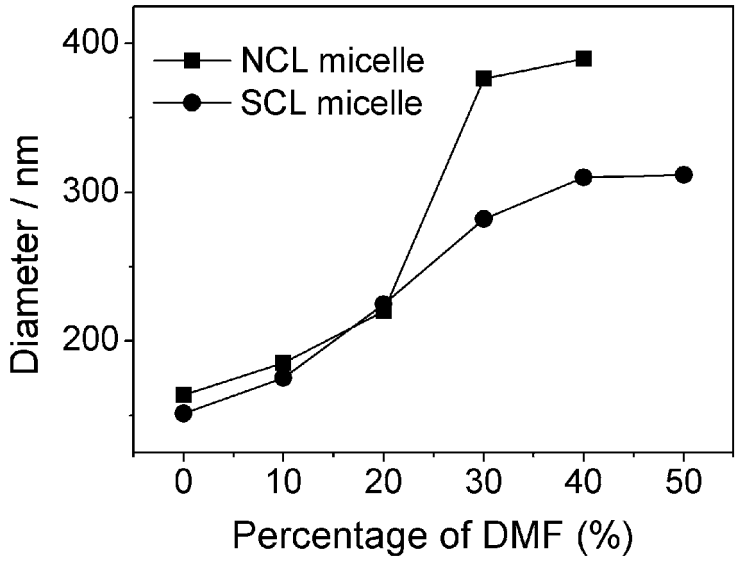
Supplementary Table 1. Feed ratio and molecular weight of synthesized PEG-PCys(Z)-PPhe

Polymer	EG/Cys-NCA/Phe-NCA feed molar ratio	EG/Cys/Phe molar ratio in polymer	*M*w[a]	*M*w[b]
P1	113/9/20	113/8/18	7400	9500
P2	113/9/40	113/8/35	8200	12000

a. Calculated fom GPC
b. Calculated from ^{1}H NMR spectra.



Supplementary Fig. 1. (a). Emission spectra of pyrene with different concentrations of polymer 1; (b). Intensity of the emission spectra at 394 nm as a function of the logarithm of polymer concentration.



Supplementary Fig. 2. Transition of size of micelles with the increase of the percentage of *N*, *N*'-dimethylformamide.