Electronic Supplementary Materials (ESI)

Thermal and Photic stimuli-responsive Polydiacetylene-Liposomes with Reversible Fluorescence

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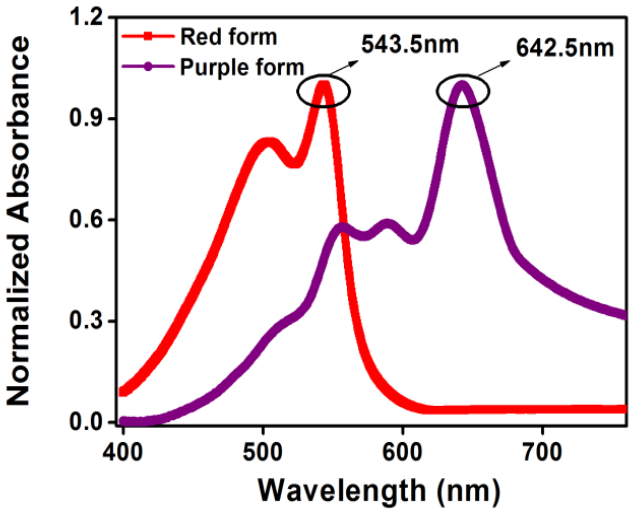
1. Material Synthesis

The PDA-liposome was prepared by the combination method of thin-film hydration and SFC-CO_2. 10,12-pentacosadiynoic acid and egg yolk lecithin were dissolved in diethyl ether with mass ratio of 1: 5 in a round-bottomed flask. Then the solvent was slowly evaporated by a rotary evaporator at 20 °C till a uniform translucent film was formed on the flask wall. The residual solvent was further eliminated completely under vacuum and was blown away by a stream of nitrogen gas with 99% purity afterwards. The lipid film was hydrated in ultrapure water (18 MΩ·cm) at a lipid concentration of 1 mg·mL^{-1} and the solution was stirred for 30 min. The whole experiment was conducted in the dark. Then the suspension was transferred into an autoclave for additional self-assembly reaction at 60 °C and 25 MPa for another 1 h. After the temperature and pressure were slowly regulated to the normal, the transparent PCDA-liposome was transferred and stored in a nitrogen-filled bottle in the dark at 4 °C overnight. The polymerization process of PCDA-liposome was conducted in aqueous solution in a photochemical chamber reactor at 298 K. The PCDA-liposome was polymerized under UV irradiation at 254 nm and 24 W power for 30 seconds.

2. Absorption spectra of PDA-liposomes

The absorption spectra of PDA-liposome were measured by UV spectroscopy (UV-2450, Shimadzu, Japan) at 298 K. The absorption spectra of the red and the purple PDA-liposomes are shown in Fig S1. The maximum absorbance wavelengths (λ_{max}) are 543.5 nm and 642.5 nm for the red and the purple PDA-liposomes, respectively.

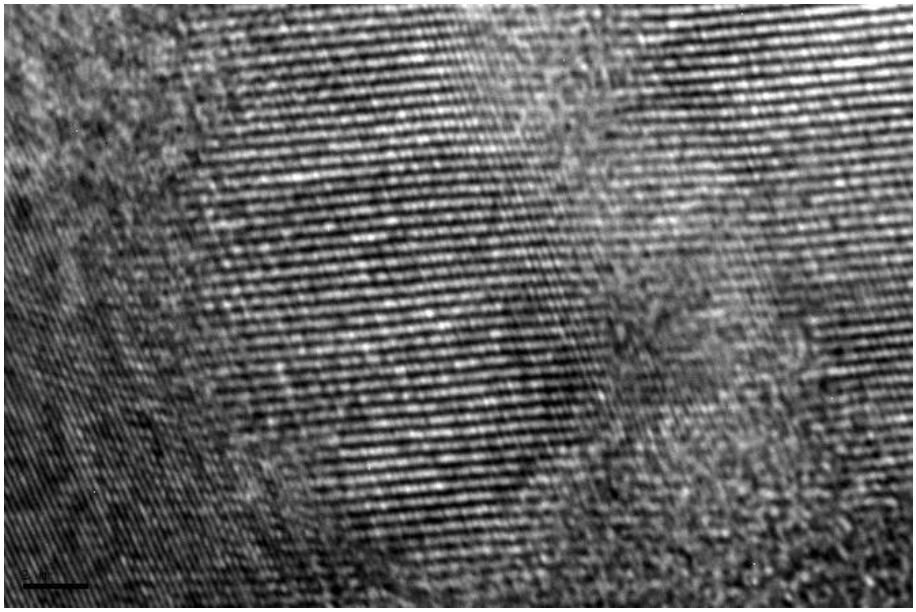
Fig. S1：Absorption spectra of red (red line) and purple (purple line) PDA-liposomes.

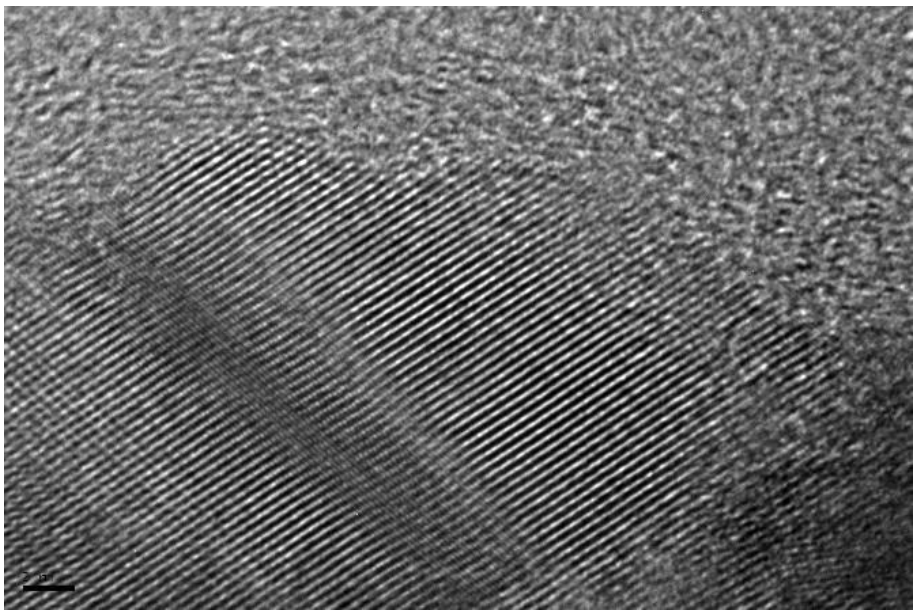


3. HRTEM images of PDA-liposomes

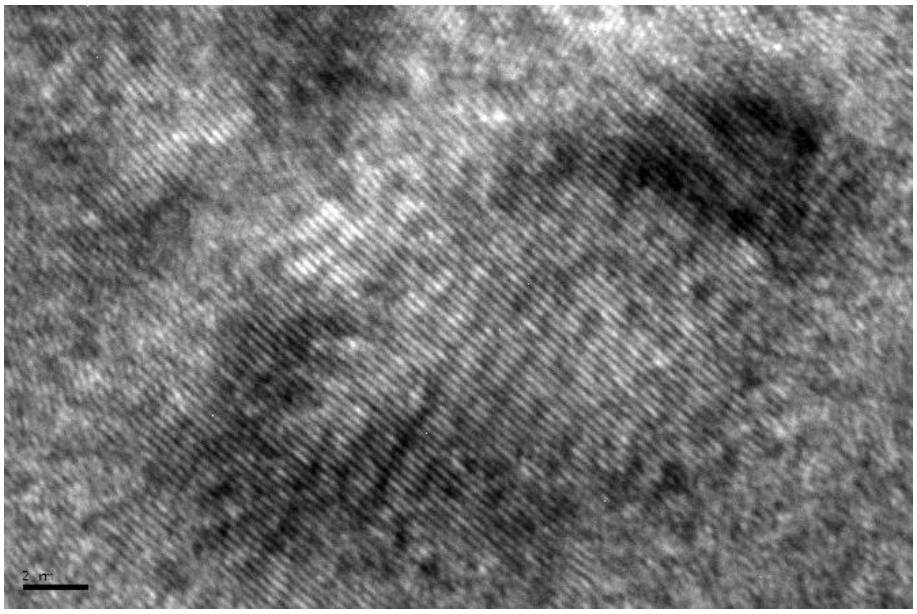
Bright-field TEM images of the red and purple PDA-liposomes were obtained using a Hitachi TEM system, operating at 80 KV, 298K. Specimens were prepared by depositing and dying drops of the PDA-liposome solution on 300-mesh carbon-coated copper grids at 20 °C and drying in the dark overnight. The crystal lattice distances for the red and purple forms were 0.357 and 0.216 nm, respectively.

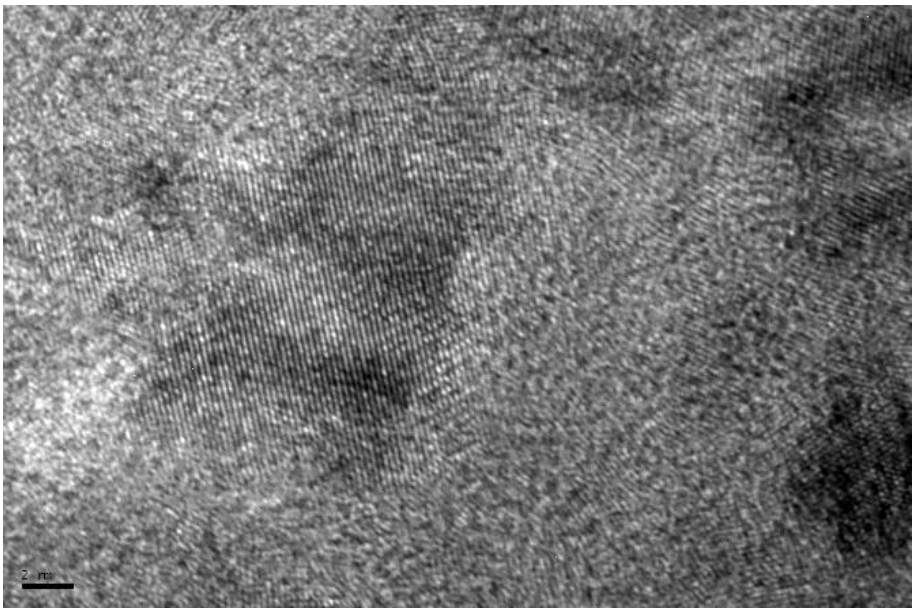
Fig. S2：HREM images of red and purple PDA-liposomes.





HREM images of red PDA-liposome



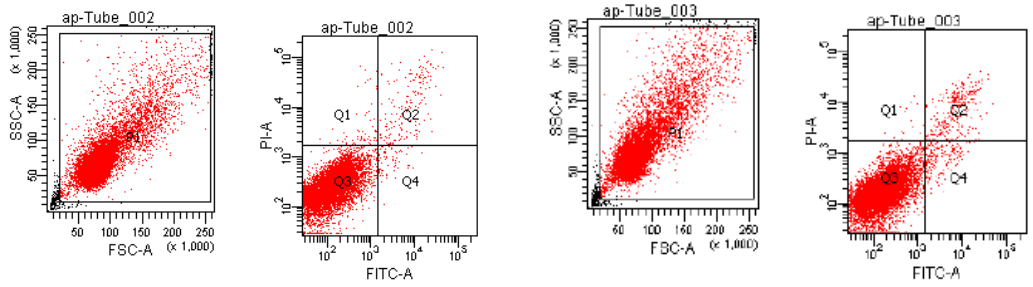


HREM images of purple PDA-liposome

4. Cytotoxicity and biocompatibility of PDA-liposomes

In order to examined the toxicity of PDA-lipsomes, cytotoxicity tests were performed by incubating PDA-liposome with Human Breast Carcinoma Bcap-37 Cells or PBS buffer at 37 °C in carbon dioxide cell incubator for 24 h, and detected by flow cytometry using annexin V-FITC and propidium iodide (PI) staining. And the apoptosis rates of the PDA-liposomes and the control group on Bcap-37 cells for 24 h were 5.7 % and 2.9 %, respectively.

Fig. S3: The apoptosis results of (a) PDA-liposomes on Bcap-37 cells and (b) control group.



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Tube Name: Tube_002
Record Date: Nov 28, 2012 4:14:11 PM
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Population	#Events	%Parent	FITC-A Mean	PI-A Mean
P1	9,520	95.2	381	747
Q1	53	0.6	734	8,569
Q2	186	2.0	10,175	22,451
Q3	9,203	96.7	157	262
Q4	78	0.8	3,233	859

(a)

Experiment Name: 20121128-2
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Population	#Events	%Parent	FITC-A Mean	PI-A Mean
P1	9,183	91.8	609	504
Q1	14	0.2	605	5,528
Q2	298	3.2	9,623	9,105
Q3	8,642	94.1	209	191
Q4	229	2.5	3,986	800

(b)

5. Membrane permeability of PDA-liposomes

In order to examined the biomimetic and biophylicity properties of PDA-lipsomes, transmembrane process was performed on the red PDA-liposome with Bap-37 cells in vitro. The fluorescence image of PDA-liposomes was obtained by the laser scanning confocal microscopy (LSCM, Leica DM6000 CS).

Figure S4： LSCM image of Bcap-37 cells treated with PDA-liposomes at 37 °C in a moist atmosphere containing 5% CO_2 for 2 h: (a) fluorescence image; (b) composite bright-filed image and fluorescence image.