Electronic Supplementary Information

Noncytotoxic Polycaprolactone-polyethyleneglycol-epsion-poly(L-lysine) Triblock Copolymer Synthesized and Self-assembled as an Antibacterial Drug Carrier

Chuncai Zhou*, Xinyu Zhou, Xiaokai Su

Department of Polymeric Materials, School of Materials Science and Engineering, Tongji University, 4800 Caoan Road, Shanghai 201804, China.

Email: cczhou@tongji.edu.cn

Dynamic light scatting (DLS) Measurements

The hydrodynamic diameters (D_h) and polydispersity index (PDI) of PCL_{35}-*b*-PEG_{45}-*b*-EPL_{23} vesicles were tested by dynamic light scatting (DLS). 1.5 mL of the prepared PCL_{35}-*b*-PEG_{45}-*b*-EPL_{23} vesicles solution was added into the cuvette and then put into the instrument for size and PDI test. Each reported measurement was tested for three times.

The principle of DLS is as follows. Due to Brownian motion, the relationship between the size of a particle and its speed is defined by the Stokes–Einstein equation[1]:

$$D_h = \kappa T / 3\pi\eta D$$

where D_h is the hydrodynamic diameter (defined as the diameter of a sphere that has the same diffusion coefficient), κ is the Boltzmann constant (J K^{-1}), T is the absolute temperature (K), η is the viscosity of the medium (kg m^{-1} s^{-1}), and D is the average diffusion coefficient (m^2 s^{-1}), which can be evaluated by illuminating the particles with a laser and analyzing the intensity fluctuations in the scattered light.

Besides, PDI is a parameter representing uniformity of particle size, which is defined as[2]:

$$PDI = (\sigma / d)^2$$

where d is the mean hydrodynamic diameter and the σ is the standard deviation. The lower the PDI value, the closer the distribution is to monodispersed. All these calculations can be conducted by the DLS instrument itself, then output D_h and PDI results directly.

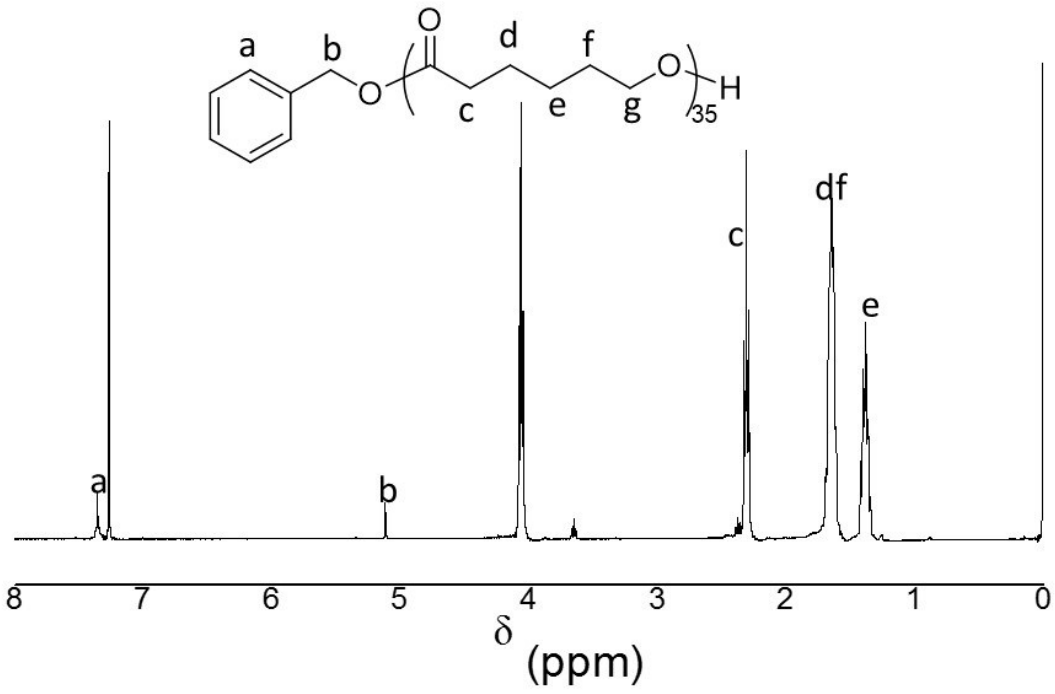

Figure S1 ^{1}H NMR spectrum of PCL in $CDCl_3$.

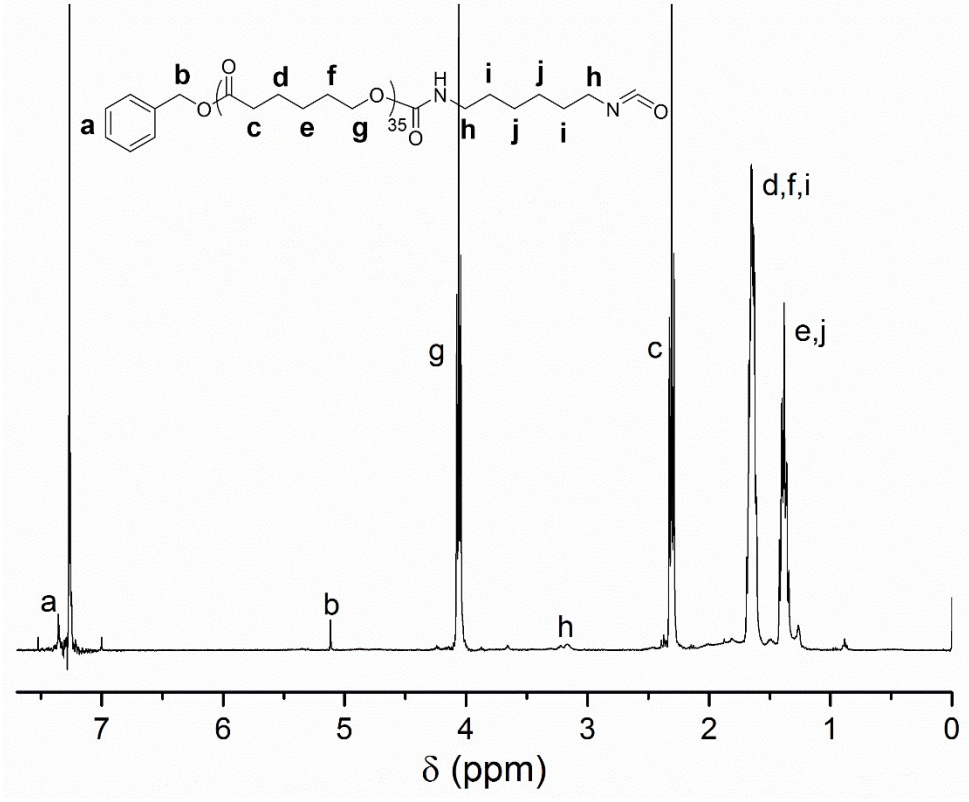

Figure S2 ^{1}H NMR spectrum of PCL_{35}-NCO in $CDCl_3$.

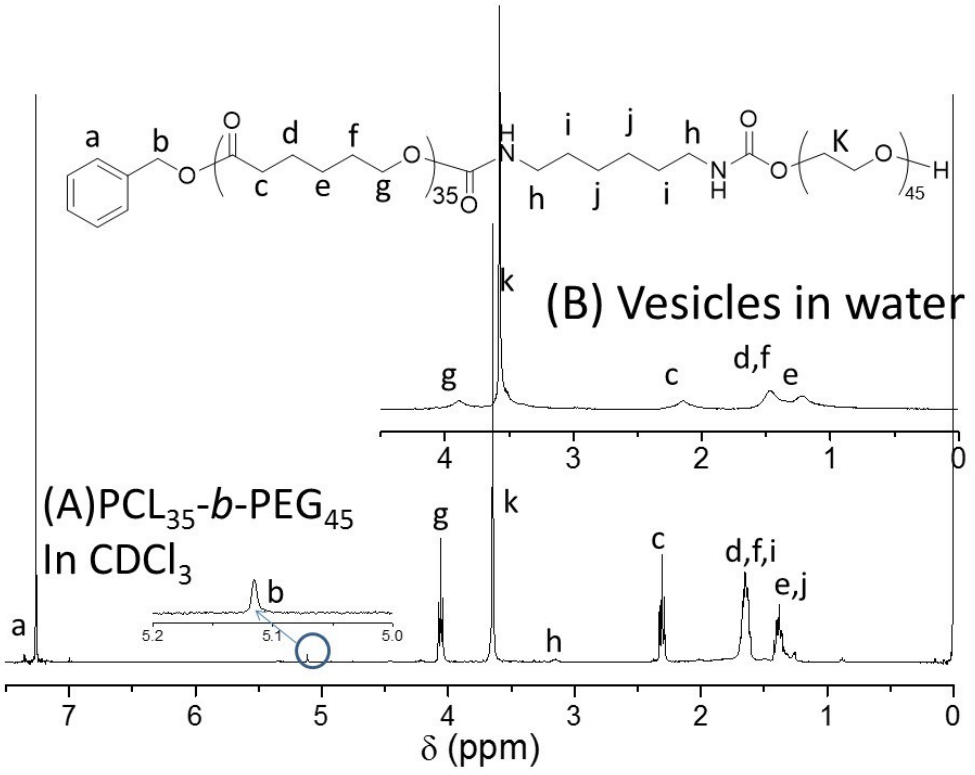

Figure S3 ^{1}H NMR spectrum of PCL_{35}-*b*-PEG_{45} in $CDCl_3$ and in D_2O.

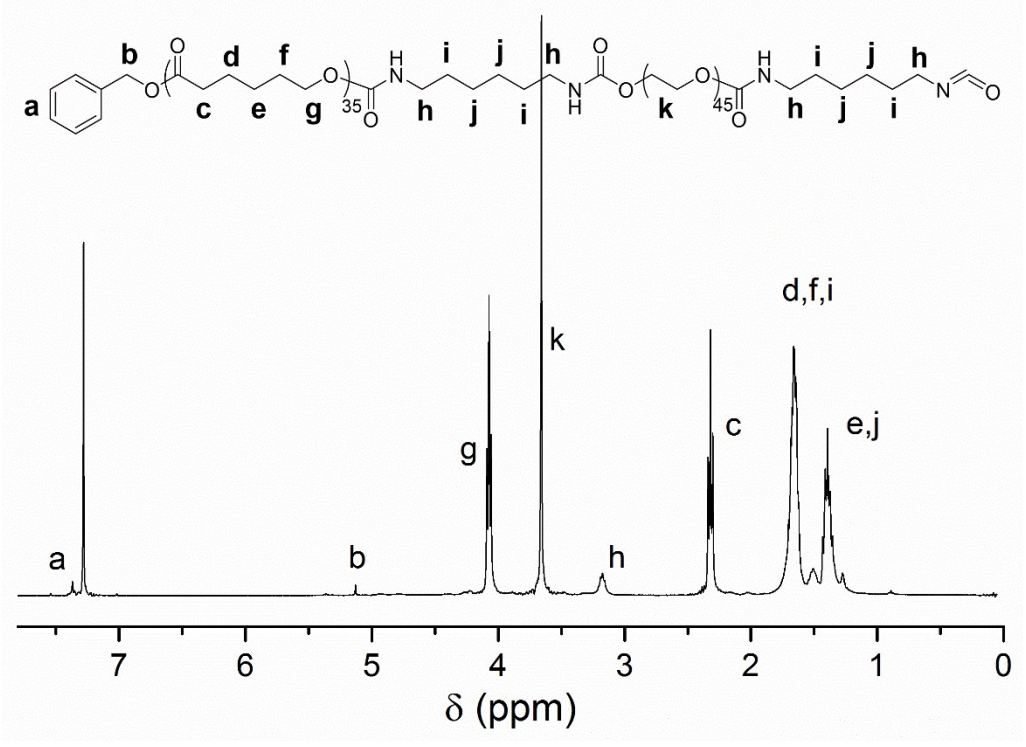

Figure S4 ^{1}H NMR spectrum of PCL_{35}-*b*-PEG_{45}-*b*-NCO in $CDCl_3$.

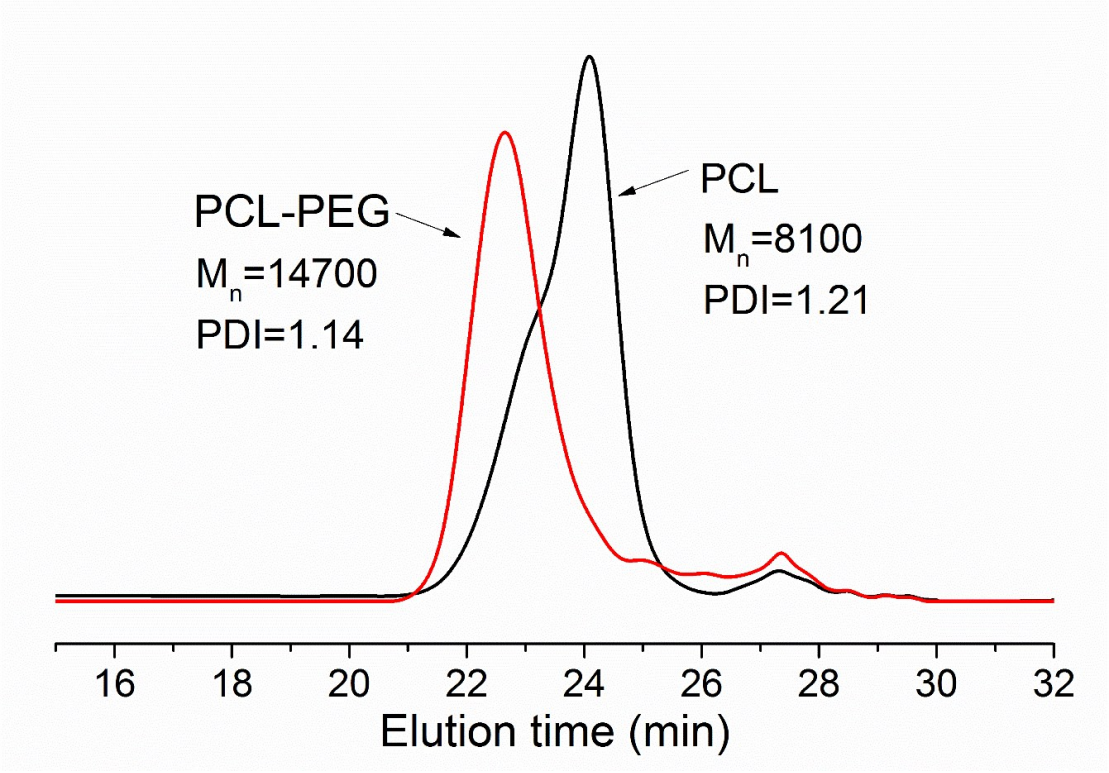

Figure S5 GPC trace of PCL_{35} and PCL_{35}-*b*-PEG_{45} in THF as the eluent at 25 °C.

As Figure S5 shown, the PDI values of PCL and PCL-PEG was 1.21 and 1.14, respectively. This confirmed narrow molecular weight distribution of these polymers. In addition, the molecular weight of PCL and PCL-PEG are higher than the results calculated by ^{1}H NMR. This may be possible because GPC tests are calibrated with polystyrene standard which is different from our polymers and this will cause some errors in final results.

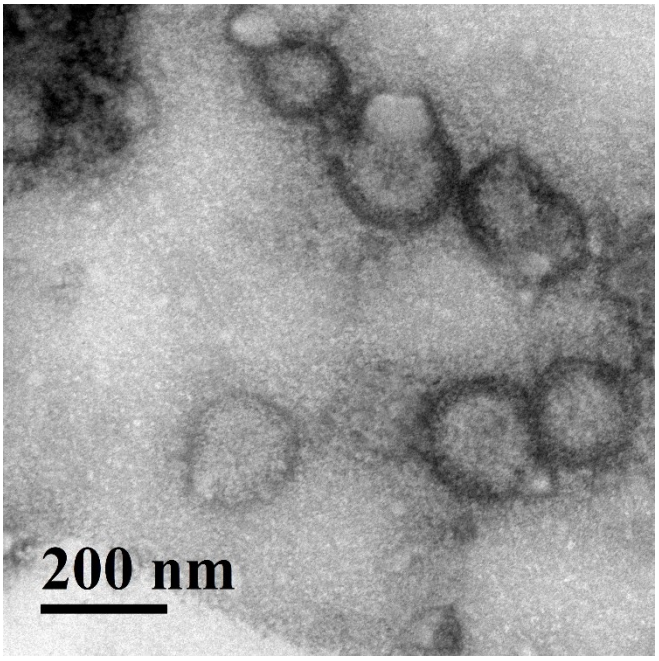

Figure S6 TEM image of PCL_{35}-*b*-PEG_{45}-*b*-EPL_{23} vesicles.

References

1 I. L. Hsiao and Y.-J. Huang, *Sci. Total Environ.* 2011, **409**, 1219-1228.
2 Z. Qin, J. Joo, L. Gu and M. J. Sailor, *Part. Part. Syst. Charact.*, 2014, **31**, 252-256.