Supporting Information

Synthesis of an amphiphilic PEG-PCL-PSt-PLLA-PAA star quintopolymer and its self-assembly for pH-sensitive drug delivery
Huanhuan Liu, Ke Miao, Guangdong Zhao, Cangxia Li and Youliang Zhao*
Jiangsu Key Laboratory of Advanced Functional Polymer Design and Application, Department of Polymer Science and Engineering, College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou 215123, China

Scheme S1. Synthetic routes to PEG-(N₃)₂ (A) and alkyne-mid-functionalized PCL-ₜ-PSt (BC) and PLLA-ₜ-PrBA (DE’) diblock copolymers

Table S1. Solubility of ABCDE star and its precursors (A = PEG; B = PCL; C = PSt; D = PLLA, E’ = PrBA; E = PAA) in various solvents

<table>
<thead>
<tr>
<th>Sample</th>
<th>hexane</th>
<th>toluene</th>
<th>ether</th>
<th>methanol</th>
<th>acetone</th>
<th>water</th>
<th>THF</th>
<th>chloroform</th>
<th>dioxane</th>
<th>DMSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>DE</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>ABCDE’</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>–</td>
<td>±</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>ABCDE</td>
<td>–</td>
<td>+</td>
<td>–</td>
<td>–</td>
<td>±</td>
<td>–</td>
<td>±</td>
<td>–</td>
<td>±</td>
<td>+</td>
</tr>
</tbody>
</table>

+: soluble; ±: partly soluble; –: insoluble.
Fig. S1 $^1$H NMR spectra of alkyne-functionalized PCL (a) and PCL-$b$-PSt (b) and one-azide-functionalized ABC star (c).

Fig. S2 GPC traces of PEG-(N$_3$)$_2$ ($M_{n,GPC} = 3380$, PDI = 1.08), PCL ($M_{n,GPC} = 10900$, PDI = 1.11) and PCL-$b$-PSt ($M_{n,GPC} = 14200$, PDI = 1.12).
Fig. S3 IR spectra of PEG-(N\textsubscript{3})\textsubscript{2}, PCL and PCL-\textit{b}-PSt.

Fig. S4 IR spectra of DE (a) and S2 (b) copolymers obtained by hydrolysis.
Fig. S5 $^1$H NMR spectrum of PEG-PCL-PSt-PLLA-PAA (S2) star in DMSO-$d_6$.

Fig. S6 TEM image of self-assembled nanostructures formed by PEG-PCL-PSt (a), PLLA-$b$-PAA (b), and PEG-PCL-PSt-PLLA-PAA (S2, c) copolymers in aqueous solution ($c = 0.50$ mg mL$^{-1}$).
Fig. S7 DLS plots of PEG-PCL-PSt-PLLA-PAA (S2, c = 0.50 mg mL\(^{-1}\)) aggregates in PBS solution (pH 7.4 or 5.3, 50 mM) at 37 °C for different time periods (t = 0, 2, 12, 36 and 72 h).

Fig. S8 Cytotoxicity of blank (a-c) and DOX-loaded (d) S2 vesicles on L02 cells as measured by MTT assay, in which L02 cells were exposed to different concentrations of copolymer aggregates at 37 °C for 12 (a), 24 (b), and 48 h (c and d).