Supporting Information

Homoserine lactone as a structural key element for the synthesis of multifunctional polymers

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1. Synthesis of the thiolactone-lactone coupler (1)

Figure S1. $^{13}$C NMR spectrum of thiolactone-lactone (1) measured in DMSO-d$_6$.

Figure S2. FTIR spectrum of thiolactone-lactone (1).

2. Model reaction of coupler 1 with hexylamine in a 1:1 molar ratio
Figure S3. $^1$H NMR spectrum of compound 2 measured in DMSO-$d_6$.

Figure S4. $^{13}$C NMR spectrum of compound 2 measured in DMSO-$d_6$.

Figure S5. H,H-COSY NMR spectrum of compound 2 measured in DMSO-$d_6$. 
Figure S6. HSQC NMR spectrum of compound 2 measured in DMSO-d6.

Figure S7. NALDI-TOF spectrum of compound 2.

Table S1. Identified signals of the NALDI-TOF measurement of the addition product of the addition one equivalent hexylamine to the thiolactone-lactone coupler (1). Reported signals describe masses of [M + Na⁺] (MW = 22.99 g · mol⁻¹).

<table>
<thead>
<tr>
<th>Product</th>
<th>m/z (calculated)</th>
<th>m/z (found)</th>
<th>intensity [a.u.]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>353.15</td>
<td>353.128</td>
<td>2902</td>
</tr>
<tr>
<td>Disulfide of 2</td>
<td>681.29</td>
<td>681.208</td>
<td>3270</td>
</tr>
</tbody>
</table>
3. Model reaction of coupler 1 with hexylamine in a 1:2 molar ratio

Figure S8. $^1$H NMR spectrum of compound 3 measured in DMSO-$d_6$.

Figure S9. $^{13}$C NMR spectrum of compound 3 measured in DMSO-$d_6$. 
Figure S10. H,H-COSY NMR spectrum of compound 3 measured in DMSO-d6.

Figure S11. HSQC NMR spectrum of compound 3 measured in DMSO-d6.
Table S2. Identified signals of the NALDI-TOF measurement of the addition product of the addition of two equivalents hexylamine to the thiolactone-lactone coupler (1). Reported signals describe masses of \([\text{M + Na}^+]\) (MW = 22.99 g · mol⁻¹).

<table>
<thead>
<tr>
<th>Product</th>
<th>m/z (calculated)</th>
<th>m/z (found)</th>
<th>intensity [a.u.]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>454.27</td>
<td>454.268</td>
<td>5819</td>
</tr>
<tr>
<td>Disulfide of 3</td>
<td>883.53</td>
<td>883.501</td>
<td>403</td>
</tr>
</tbody>
</table>

4. Polyaddition reaction with of PEG-diamine to coupler 1

Table S3. Reagent ratios for the synthesis of 4a-d (T = 90 °C, t = 16 h).

<table>
<thead>
<tr>
<th>polymer</th>
<th>m₁ [g]</th>
<th>mMA [g]</th>
<th>mPEG-diamine [g]</th>
<th>VDMF [mL]</th>
<th>c [g · mol⁻¹]</th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>0.249</td>
<td>0.094</td>
<td>0.400</td>
<td>2.170</td>
<td>0.5</td>
</tr>
<tr>
<td>7b</td>
<td>0.100</td>
<td>0.038</td>
<td>0.161</td>
<td>0.436</td>
<td>1.0</td>
</tr>
<tr>
<td>7c</td>
<td>0.100</td>
<td>0.038</td>
<td>0.161</td>
<td>0.291</td>
<td>1.5</td>
</tr>
<tr>
<td>7d</td>
<td>0.100</td>
<td>0.038</td>
<td>0.161</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Figure S13. $^1$H NMR spectrum of the reaction of thiolactone-lactone (4) with PEG-diamine measured in DMSO-$d_6$.

5. Synthesis of PG26 (5)

Figure S14. $^1$H NMR spectrum of PG26 (5) measured in DMSO-$d_6$.

Figure S15. $^{13}$C NMR spectrum of PG26 (5) measured in DMSO-$d_6$. 
6. Functionalization of polyglycidol (5) with DL-homoserine lactone hydrobromide

Figure S16. DMF-SEC traces of PG$_{26}$ (5).

![DMF-SEC traces of PG$_{26}$ (5).](image)

Figure S17. $^1$H NMR spectrum of P(GNPC)$_{26}$ (6) measured in DMSO-$d_6$.  

![$^1$H NMR spectrum of P(GNPC)$_{26}$ (6).](image)
Figure S18. $^{13}$C NMR spectrum of P(GNPC)$_{26}$ (6) measured in DMSO-$d_6$.

Figure S19. DMF-SEC traces of P(GNPC)$_{26}$ (6).
**Figure S20.** $^{13}$C NMR spectrum of P(G\textsuperscript{HSI})\textsubscript{26} (7) measured in DMF-$d_7$.

**Figure S21.** DMF-SEC traces of P(G\textsuperscript{HSI})\textsubscript{26} (7).

7. Ring-opening of P(G\textsuperscript{HSI})\textsubscript{26}
Figure S22. $^1$H NMR spectrum of P(G$_{\text{ISL-9}}$)$_{26}$ (8) measured in DMSO-$d_6$.

Figure S23. $^{13}$C NMR spectrum of P(G$_{\text{ISL-9}}$)$_{26}$ (8) measured in DMSO-$d_6$.

Figure S24. DMF-SEC traces of P(G$_{\text{ISL-9}}$)$_{26}$ (8).
8. Quaternization of P(GHSL-o)_{26}

Figure S25. $^1$H NMR spectrum of P(GHSL-o)_{26} (9) measured in D$_2$O.

Figure S26. $^{13}$C NMR spectrum of P(GHSL-o)_{26} (9) measured in D$_2$O.