Supporting Information

Synthesis of amino acid N-Carboxyanhydrides

**Synthesis of γ-Benzyl-L-glutamate-N-carboxyanhydride (3c)**: To a solution of γ-Benzyl-L-glutamate amino acid (1 g, 4.21 mmol) in freshly distilled tetrahydrofuran (10 ml) was added a solution of triphosgene (625 mg, 2.11 mmol) in anhydrous tetrahydrofuran (4 ml) under argon and the reaction mixture was heated to 50°-55° C. Then α-pienene (1.0 ml, 6.32 mmol) was added and the reaction mixture was allowed to stir for 2 hrs. The reaction mixture was then cooled to room temperature and thereafter poured into dry hexane (400 ml) to afford a white precipitate. The white precipitate of N-carboxyanhydrides was filtered off by vacuum quickly and crystallized two more times by using ethyl acetate/petroleum ether mixtures. Finally the precipitate of γ-Benzyl-L-glutamate-N-carboxyanhydride was dried under vacuum and transferred into glove box. Final yield 900 mg (81%).

Compound 3c: \(^1\)H NMR (400.13 MHz, CDCl\(_3\)): \(\delta = 2.33-2.58\) (m, 2H), 2.85 (t, 2H, \(J = 7.0\) Hz), 4.66 (t, 1H, \(J = 6.0\) Hz), 5.40 (s, 2H), 7.25 (bs, 1H), 7.61-7.65 (m, 5H); \(^{13}\)C NMR (100.61 MHz, CDCl\(_3\)): \(\delta = 26.7, 29.5, 56.7, 67.0, 128.2-128.7, 135.2, 152.2, 169.9, 172.3\).

**Synthesis of ε-N-carbobenzoxy-L-lysine-N-carboxyanhydride (3d)**: To a solution of ε,α-di-N-carbobenzoxy-L-lysine (1 g, 2.41 mmol) in freshly distilled diethyl ether (10 ml) was added phosphorous pentachloride (603 mg, 2.90 mmol) under argon at 0°-5° C and the reaction mixture was allowed to stir for 30 min. As soon as the reaction mixture turned homogeneous, the solvent was removed slowly under reduced pressure and the residue redissolved in dry ethyl acetate. The mixture was filtered to remove undissolved solid particles and the filtrate was poured into dry hexane (400 ml) to afford white precipitate. The white precipitate of N-carboxyanhydride was filtered off by vacuum quickly and crystallized two more times by using ethyl acetate/petroleum ether mixtures. Finally precipitate of ε-N-carbobenzoxy-L-lysine-carboxyanhydride was dried under vacuum and transferred into glove box. Final yield 500 mg (67%).

Compound 3d: \(^1\)H NMR (400.13 MHz, CDCl\(_3\)): \(\delta = 1.32-1.56\) (m, 4H), 1.70-1.91 (m, 2H), 3.12 (dd, 2H, \(J = 6.5, 12.8\) Hz), 4.33 (t, 1H, \(J = 6.0\) Hz), 5.07 (s, 2H), 5.70 (bs, 1H), 6.96 (bs, 1H), 7.31-7.42 (m, 5H); \(^{13}\)C NMR (100.61 MHz, CDCl\(_3\)): \(\delta = 22.6, 29.9, 31.7, 41.0, 58.3, 66.7, 128.5-129.4, 138.4, 152.9, 157.4, 172.1\).

**Synthesis of γ-p-OMe-benzyl-L-glutamate-N-carboxyanhydride (3e)**: To a solution of γ-p-OMe-benzyl-L-glutamate amino acid (1 g, 3.74 mmol) in freshly distilled tetrahydrofuran (10 ml) was added a solution of triphosgene (555 mg, 1.87 mmol) in anhydrous tetrahydrofuran (4 ml) under argon and the reaction mixture was heated to 50°-55° C. Then α-pienene (0.89 ml, 5.6 mmol) was added and the reaction mixture was allowed to stir for 2
hrs. The reaction mixture was then cooled to room temperature, thereafter poured into dry hexane (400 ml) and then kept in the refrigerator for 4-5 hrs at -20° C under argon to afford a white precipitate. The white precipitate of N-carboxyanhydride was filtered off by vacuum quickly and crystallized two more times by using ethyl acetate/petroleum ether mixture. Finally the white precipitate of \( \gamma \)-p-OMe-benzyl-L-glutamate-N-carboxyanhydride was dried under vacuum and transferred into the glove box. Final yield 800 mg (80%).

Compound 3e: \(^1\)H NMR (400.13 MHz, CD\(_3\)CN): \(\delta = 1.98-2.23\) (m, 2H), 2.49 (dt, 2H, \(J = 3.3, 7.4\) Hz), 3.80 (s, 3H), 4.41 (t, 1H, \(J = 6.6\) Hz), 5.05 (s, 2H), 6.86 (bs, 1H), 6.93 (m, 2H), 7.32 (m, 2H); \(^{13}\)C NMR (100.61 MHz, CD\(_3\)CN): \(\delta = 27.4, 30.1, 55.8, 57.4, 66.9, 114.8\) (2C), 129.1, 130.9 (2C), 152.7, 166.6, 171.7, 172.2.

**Synthesis of poly-L-glutamate-b-poly-per-O-benzoylated-D-glucose-L-Lysine (9)**

To a solution of Poly-PMBnLG-b-poly-per-O-benzoylated-D-glucose-L-lysine (6a) polymer in dichloromethane was added 10% TFA in dichloromethane (2.5 equivalent) and the reaction mixture was stirred for 30 min at room temperature. The reaction was then quenched by the addition of triethylamine (3 equivalent) and the volume of the reaction mixture was reduced to half. The polymer was precipitated out by addition of diethyl ether and resultant white precipitate (9) was collected by centrifugation. The complete deprotection of the p-methoxybenzylester was confirmed by \(^1\)H (S1 and S2) and \(^{13}\)C NMR (page 18) as shown below. Yield 90%.

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**S1.** \(^1\)H NMR of 6a
S2. $^1$H NMR of polymer 9.

**Estimation of the monomer ratio in poly-PMBnLG-b-poly-per-O-benzoylated-D-glucose-L-lysine (6a)**

The ratio of PMBn-glu and β-gluco-O-lys in polymer 6a was estimated using $^1$H NMR. The ratios of the number of protons $H_d$ to $H_c$, that are characteristic of both the monomers, were used for calculation. The ratio was found out to be 1:1.5 (expected 1:1.7).

**FT-IR of the azide end functionalized glycopolypeptides 4c, 5c and 7b**
S3. FT-IR of end-functionalized polymers 4c, 5c, and 7b.

Size exclusion chromatogram of glycopolypeptide 4a (Run 1, Table 1)

S4. Size exclusion chromatogram of polymer 4a synthesized in acetonitrile

Quantitative estimation of amount of azide-PEG in polymer 7b

Scheme 4. Click reaction of Azido labeled block copolymer 7b with fluorescein-alkyne

Synthesis of fluorescein labelled block polypeptide 7c
The alkyne labelled fluorescein was synthesized according to published procedures (Bioconjugate Chem. 2005, 16, 1536). To a solution of 22 mg azide functionalized blockcopolymer (7b) in DMF was added alkyl fluorescein (1mg, 3 eq), Cu(I)Br (0.1 mg, 0.50 eq) and PMDETA (0.5 eq) under nitrogen and the reaction mixture was stirred for 24 hrs. The completion of the reaction was observed by the near dissaperance (more than 90-95%) of the azide stretching by FT-IR. Then, the solvent was removed under reduced pressure and the reaction mixture was dissolved in dichloromethane. It was then washed multiple times using dil aqueous ammonia solution to remove copper(I) salt and excess fluorescein alkyne. Finally the dichloromethane was removed and the resultant polymer 7c reprecipitated three times by addition of methanol to the solution of 7c in dichloromethane. Polymer 7c was thoroughly dried and its absorption spectra taken in UV-VIS spectrophotometer. Yield: 8 mg

*FT-IR spectra*

![FT-IR spectra](image)

**S5.** FT-IR spectra for azide functionalized polymer 7b and the crude reaction mixture upon completion of the click reaction (7c)

*UV-VIS Spectra of 7c*
Supplementary Material (ESI) for Polymer Chemistry
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S6. UV-VIS spectra of the fluorescein labelled polymer 7c solution (10 µM) in DMF/pH7 100 mM phosphate buffer mixture.

Method for estimation of azide incorporation into block copolypeptide 7b

The block copolypeptide 7b was converted to 7c using click chemistry. The theoretical concentration of the fluorescein labelled polymer 7c was calculated using the M_n value of 19,000 kDa that was obtained from GPC. Since only one fluorescein moiety will be conjugated to the polymer if all the polymer chains have one azide group attached to its end, the concentration of fluorescein in solution would be equal to the concentration of the polymer. The concentration of fluorescein in solutions of 7c was estimated from its absorption spectra ($\lambda_{max}=510 \text{ nm}$, $\varepsilon=90,000 \text{ M}^{-1}\text{cm}^{-1}$) in DMF/pH7 phosphate buffer mixtures. (Ref: Spectroscopic Letters, 1994, 27, 1049) The percentage of azide group incorporated was estimated from the ratio of the experimentally calculated concentration from absorption spectra of fluorescein to the theoretical concentration calculated from M_n values of 7b.
$^1$H and $^{13}$C Spectra of monomers and polymers
Acetonitrile-d$_3$

CD$_3$CN

$3b$


Chloroform-d

20.59  22.92  23.01  23.16  27.40  27.48  28.30  28.75  28.84  31.45  36.51  40.18  40.59  40.72  48.42  50.59  52.00  56.74  62.52  62.83  68.26  69.04  70.24  70.66  71.13  72.52  72.71  72.82  72.94  74.06  77.00  90.39  92.20

CDCl3

0.76  1.02  1.14  1.23  1.59  1.88  2.05  2.18  2.25  3.18  3.25  3.98  4.07  4.18  4.27  4.33  4.40  4.45  4.50  4.53  4.59  4.61  4.62  4.71  4.73  4.76  5.78  5.84  5.87  5.92  5.96  6.14  6.19  6.23  6.29  7.24  7.27  7.29  7.31  7.38  7.42  7.52  7.55  7.81  7.83  7.94  7.97  8.01  8.07  8.11

O

OBz

BzO

BzO

BzO

OBz

O

NH

NH

O

O

OBz

BzO

BzO

BzO

OBz

O

NH

NH

O

O

n=25

4c

gluco-

O

N3

n=11

4c

gluco-

O

O

H

n=25

5a

manno-

O


