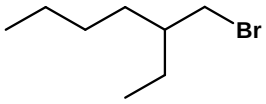
Appendix (1) structures of synthesized compounds



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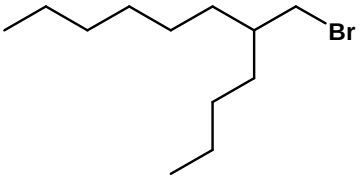

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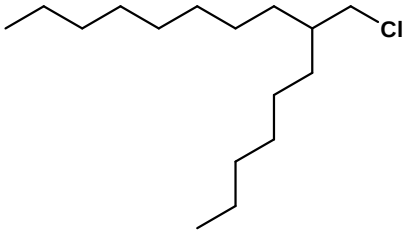

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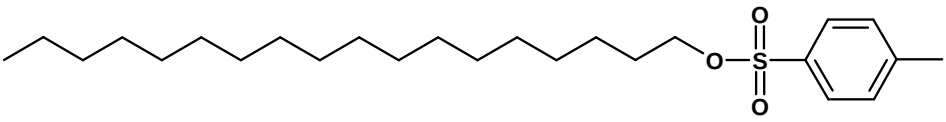

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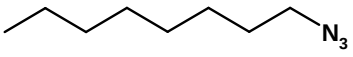

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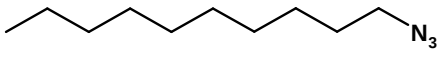

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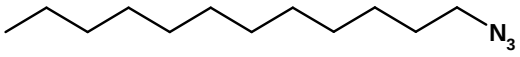

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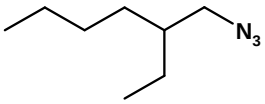

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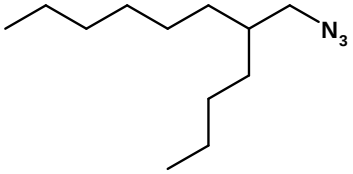

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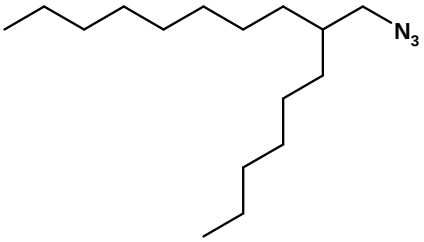

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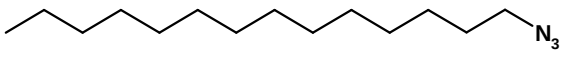

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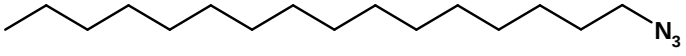

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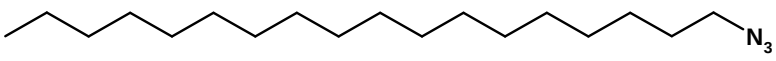

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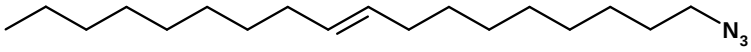

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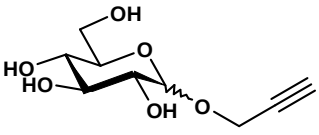

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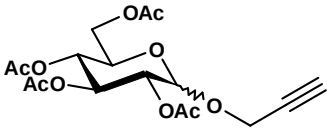

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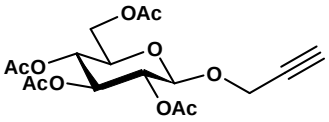

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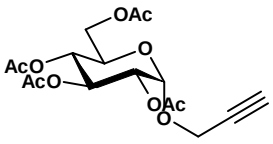

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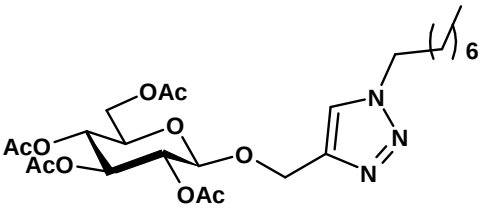

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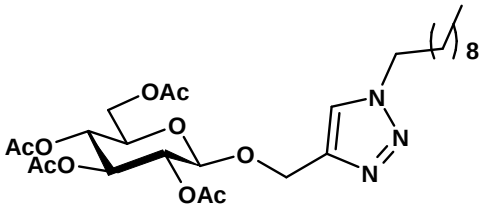

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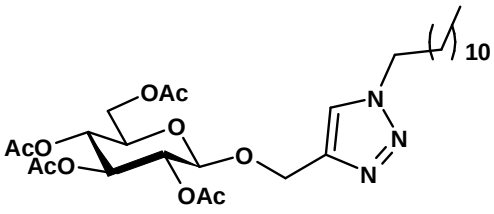

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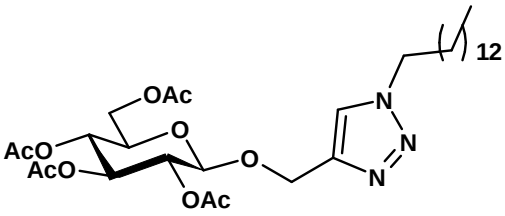

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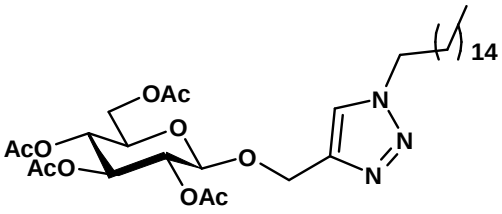
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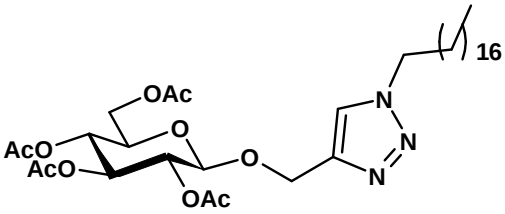
OAc
AcO
AcO
OAc
O
O
N
N
N

23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AcO
OAc
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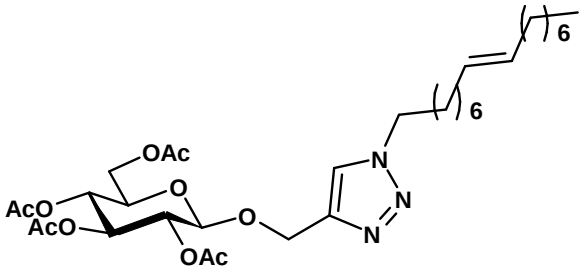
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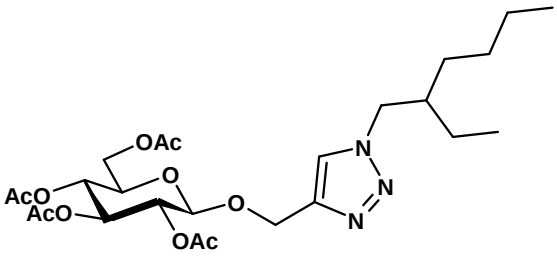
AcO
AcO
OAc
O
O
N
N
N

25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AcO
AcO
OAc
O
O
N
N
N

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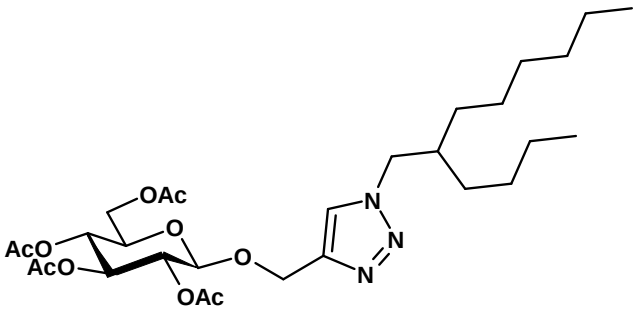
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AcO
AcO
OAc
O
O
N
N
N

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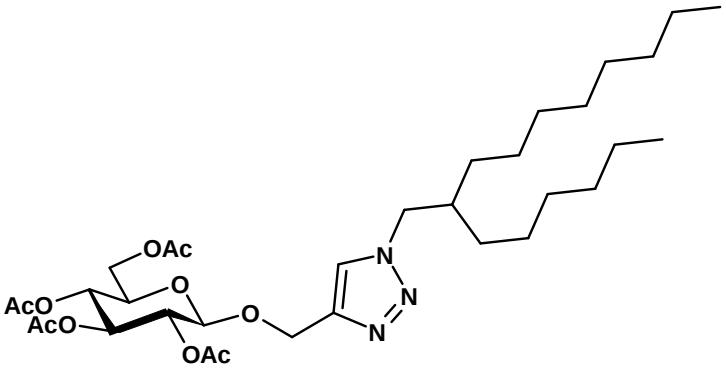

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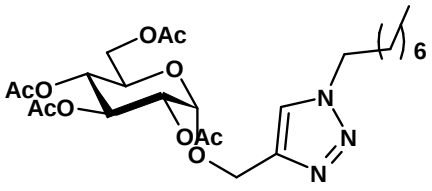

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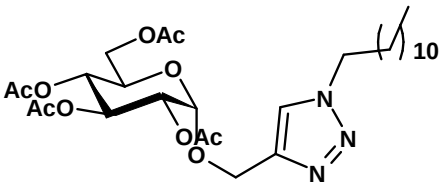

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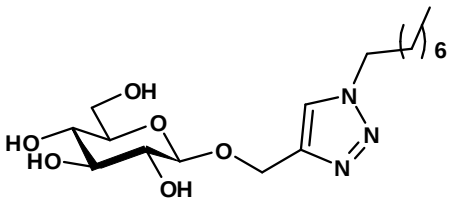

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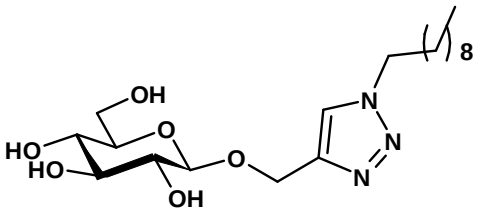

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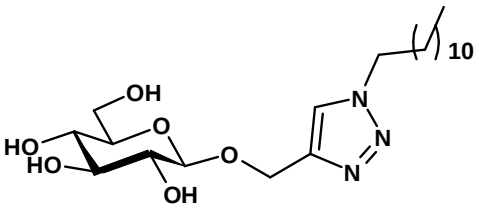

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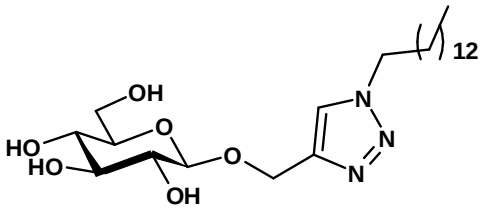

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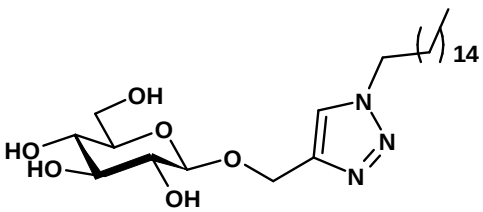

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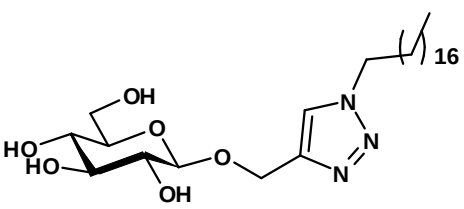

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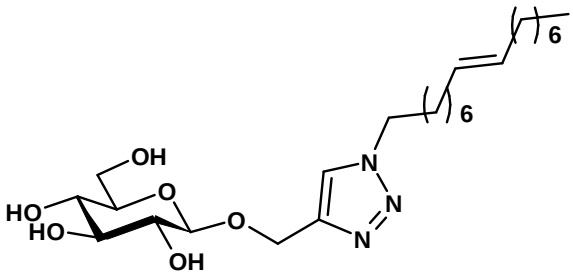
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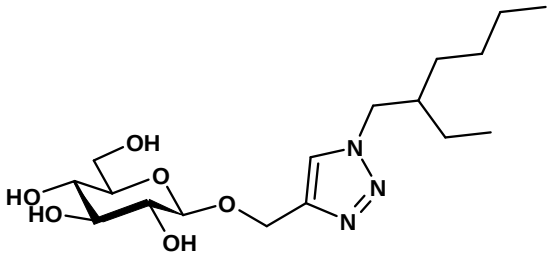
6
OH
O
HO
HO
OH
O
N
N
N

37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O
HO
HO
OH
O
N
N
N

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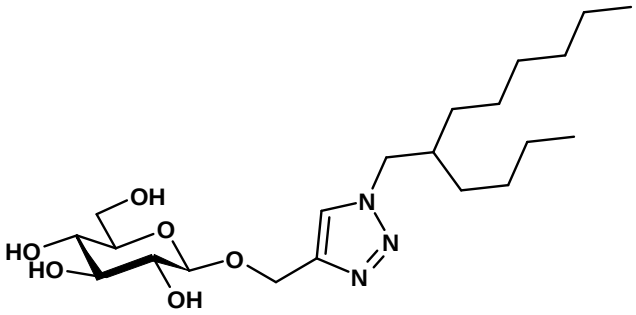
OH
O
HO
HO
OH
O
N
N
N

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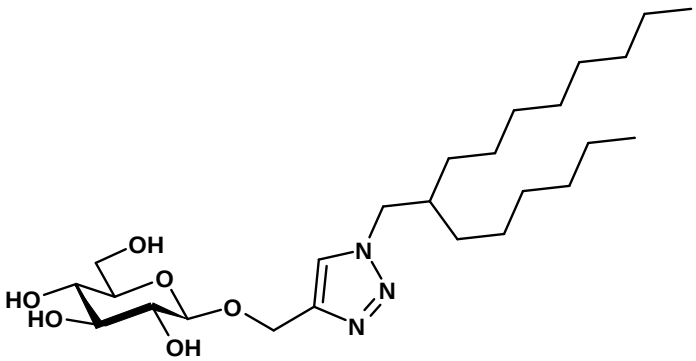
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HO
HO
OH
O
N
N
N

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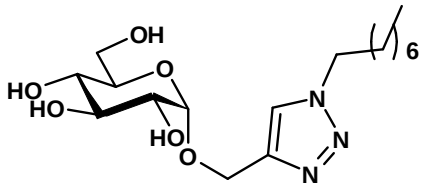

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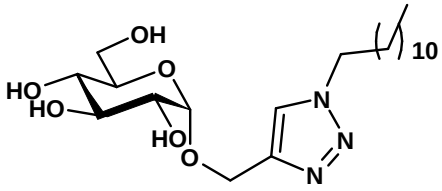

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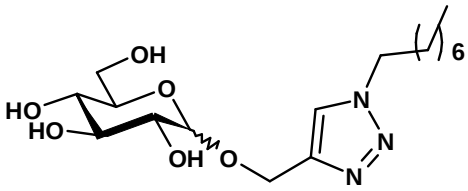

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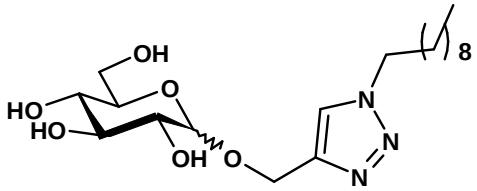

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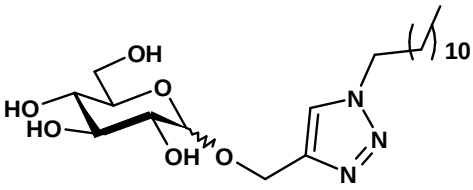

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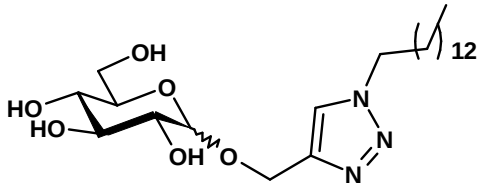

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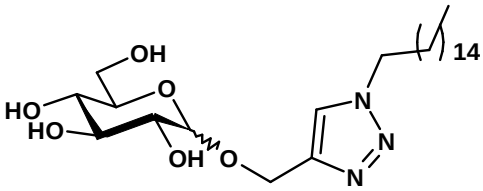

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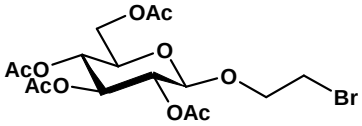

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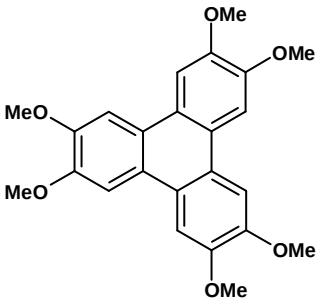
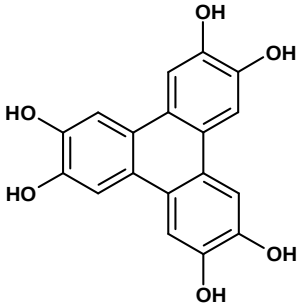
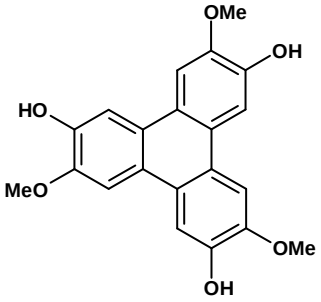
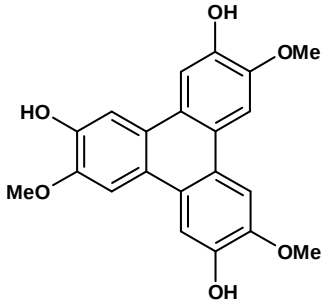

OMe
OMe
MeO
MeO
OMe
OMe

49

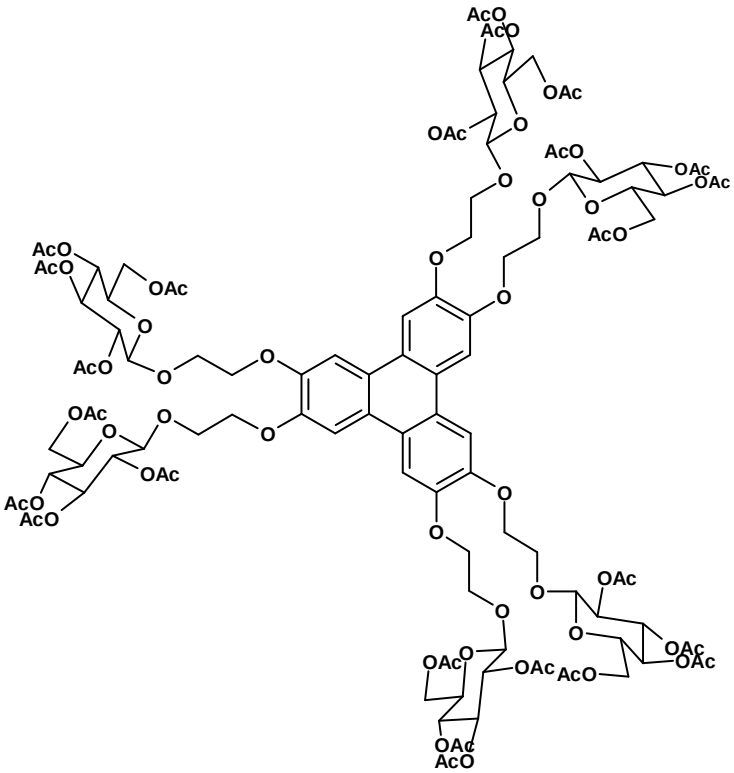

OH
OH
HO
HO
OH
OH

50


OMe
OH
HO
MeO
OMe
OH


OH
OMe
HO
MeO
OMe
OH

51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OAc
OAc
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AcO
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OAc
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AcO
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AcO
AcO
OAc
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AcO
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OAc
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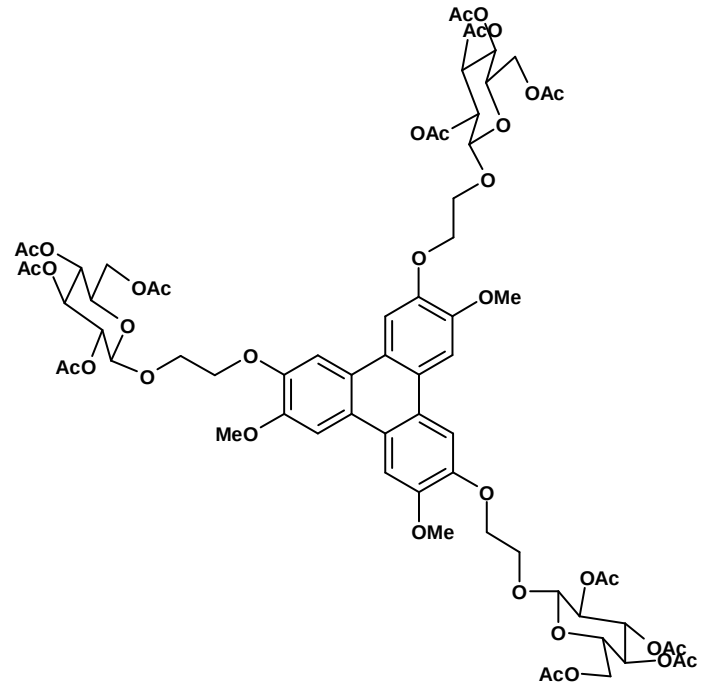
OAc
OAc
AcO
OAc
AcO

52


AcO
AcO
OAc
OAc
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AcO
AcO
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OMe
MeO
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OMe
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OAc
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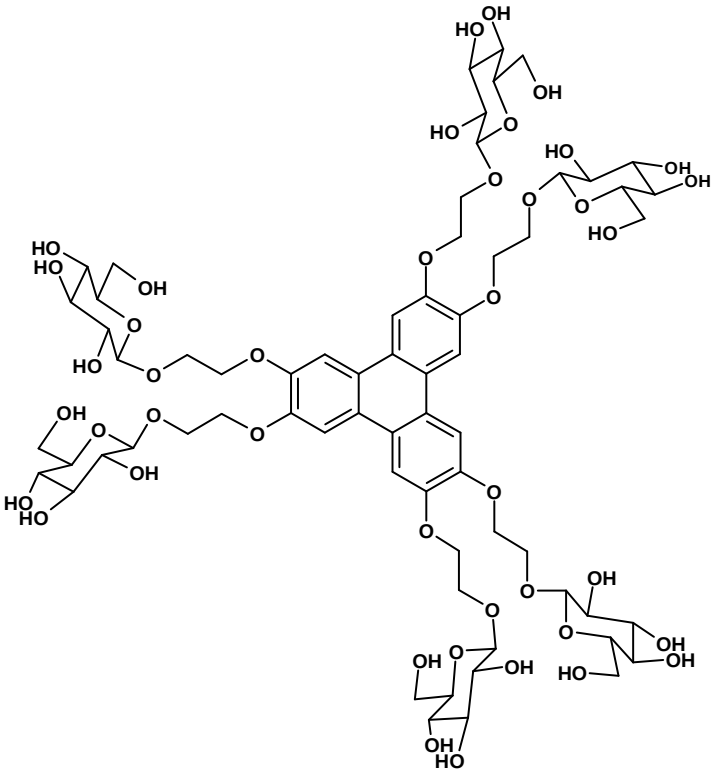
OAc
OAc
AcO

53


OH
HO
OH
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OH
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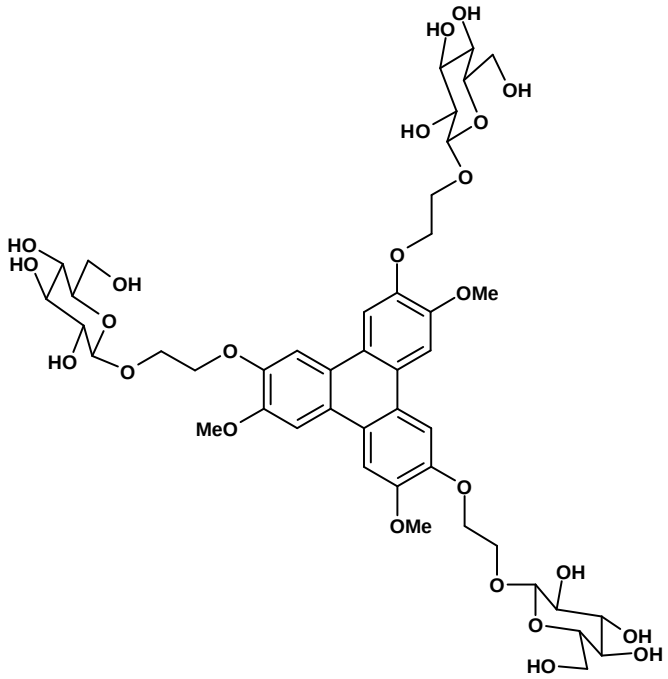
HO

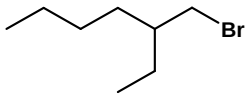
54



55

Appendix (2) Spectural data of synthesized compounds

1-Bromo-2-ethyl-hexane (MONSON, 1971; Petroski, 2002) (1)

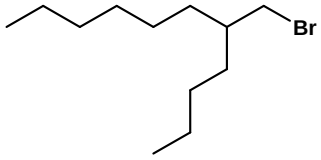


Yield = 15.1 g (78.2 mmol, 78.2 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.42 (d, 1H, α-CH_2, J=2.5 Hz), 3.40 (d, 1H, β-CH_2, J=2.5), 1.50 (m_c, 1H, CH), 1.44-1.15 (m, 8H, bulk-CH_2), 0.87, 0.85 (2t, 2x3 H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =39.45 (α), 38.1 (β), 32.30 (δ), 28.50 (γ), 26.6 (γ'), 22.61 (ω-1), 13.61 (ω), 10.40 (δ') ppm.

1-Bromo-2-butyl-octane (2)

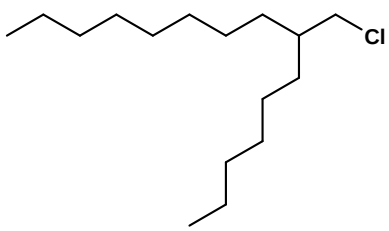


Yield = 18.2 g (72.8 mmol, 72.8 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.43 (d, 2H, α-CH_2, J=4.7 Hz), 1.65-1.49 (m, 1H, CH), 1.45-1.16 (m, 16H, bulk-CH_2), 0.86- 0.75 (m, 6 H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =39.25 (α), 38.80 (β), 32.34, 32.01, 31.57, 29.21, 28.51 (bulk-CH_2), 26.26 (γ), 22.53, 22.34 (ω-1, ω'-1), 13.65, 13.61 (ω, ω') ppm.

1-Chloro-2-hexyl-decane (3)

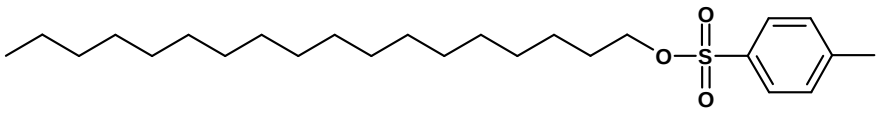


Yield = 3.8 g (14.4 mmol, 73 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.55 (d, 2H, α-CH_2, J=5.8 Hz), 1.40-1.29 (m, 1H, CH), 1.21-1.13 (m, 24H, bulk-CH_2), 0.87- 0.77 (m, 6 H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =48.40 (α), 38.74 (β), 31.40, 31.28 (ω-2, ω'-2), 30.51, 30.48, 29.34, 29.12, 29.10, 28.51 (bulk-CH_2), 26.16, 25.83 (γ, γ'), 22.33, 22.24 (ω-1, ω'-1), 13.64, 13.61 (ω, ω') ppm.

(Z)-9-octadecenyl 4-toluylsulfonate (Martin E. Dyen, 1966) (4)

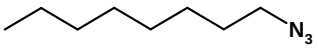


Yield = 3.6 g (8.5 mmol, 82 %), pale yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.77 (d, 2H, Ar, J=8.2 Hz), 7.30 (d, 2H, Ar, J=8.0 Hz), 5.35-5.24 (m, 2H, CH=CH), 3.93 (t, 2H, α-CH_2, J=6.5 Hz), 2.40 (s, 3H, CH_3), 1.97 (m_c, 4H, CH_2-C=C), 1.58 (m_c, 2H, β-CH_2), 1.26-1.11 (m, 22H, bulk-CH_2), 0.84 (m, 3 H, CH_3, J=6.4 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =144.88 (Ar), 133.46 (Ar), 130.17, 129.98 (HC=CH), 129.89, 128.03 (Ar), 70.55 (α), 31.56 (ω-2), 29.41, 29.33, 29.16, 28.96 (2), 28.93, 28.77, 28.54, 28.46 (bulk-CH_2), 26.85, 26.79 (CH_2-C=C), 24.94 (β), 22.29 (ω-1), 21.21 (CH_3), 13.67 (ω) ppm.

1-Azido-octane (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (5)



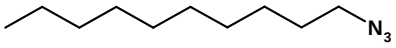
Yield = 10.4 g (67.0 mmol, 92.8 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.21 (t, 2H, α-CH_2, J=7.0 Hz), 1.55 (m_c, 2H, β-CH_2), 1.37-1.25 (m, 10H, bulk-CH_2), 0.84 (m, 3 H, CH_3, J=6.8 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =51.21 (α), 31.52(ω-2), 29.21, 28.94, 28.88 (bulk-CH_2), 26.41 (β), 22.38 (ω-1), 13.67 (ω) ppm.

IR [KBr]: 2958, 2930, 2858 (CH), 2096 (N_3), 1459, 1348, 1260 cm^{-1}.

1-Azido-decane (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (6)



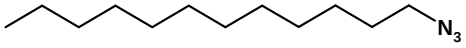
Yield = 12.3 g (67.3 mmol, 92.7 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.22 (t, 2H, α-CH_2, J=7.0 Hz), 1.53 (m_c, 2H, β-CH_2), 1.40-1.21 (m, 14H, bulk-CH_2), 0.86 (m, 3 H, CH_3, J=6.9 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =51.23 (α), 31.58 (ω-2), 29.20, 29.18, 28.93, 28.85, 28.53 (bulk-CH_2), 26.39 (β), 22.33 (ω-1), 13.61 (ω) ppm.

IR [KBr]: 2959, 2927, 2855 (CH), 2096 (N_3), 1466, 1349, 1259 cm^{-1}.

1-Azido-dodecane (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (7)



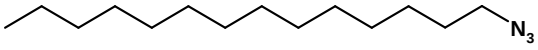
Yield = 14.1 g (66.8 mmol, 92.1 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.22 (t, 2H, α-CH_2, J=7.0 Hz), 1.57 (m_c, 2H, β-CH_2), 1.36-1.25 (m, 18H, bulk-CH_2), 0.86 (m, 3 H, CH_3, J=6.9 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =51.30 (α), 31.57 (ω-2), 29.45, 29.26, 29.22, 29.19, 28.95, 28.80, 28.61 (bulk-CH_2), 26.19 (β), 22.31 (ω-1), 13.67 (ω) ppm.

IR [KBr]: 2928, 2856 (CH), 2096 (N_3), 1466, 1348, 1262 cm^{-1}.

1-Azido-tetradecane (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (8)



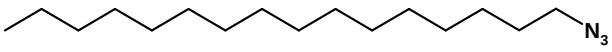
Yield = 15.8 g (66.2 mmol, 91.3 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.23 (t, 2H, α-CH_2, J=7.0 Hz), 1.58 (m_c, 2H, β-CH_2), 1.36-1.22 (m, 22H, bulk-CH_2), 0.86 (m, 3 H, CH_3, J=6.9 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =51.31 (α), 31.61 (ω-2), 29.42, 29.39, 29.36, 29.28, 29.22, 29.02, 28.89, 28.57 (bulk-CH_2), 26.44 (β), 22.38 (ω-1), 13.71 (ω) ppm.

IR [KBr]: 2957, 2931, 2860 (CH), 2097 (N_3), 1458, 1349, 1260 cm^{-1}.

1-Azido-hexadecane (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (9)



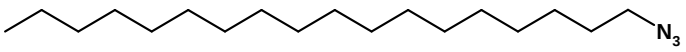
Yield = 17.7 g (66.2 mmol, 91.3 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.24 (t, 2H, α-CH_2, J=7.0 Hz), 1.57 (m_c, 2H, β-CH_2), 1.31-1.21 (m, 26H, bulk-CH_2), 0.86 (m, 3 H, CH_3, J=6.9 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =51.12 (α), 31.65 (ω-2), 29.72, 29.41(2), 29.37(2), 29.34, 29.25, 29.12, 29.08, 28.81, 28.57 (bulk-CH_2), 26.24 (β), 22.38 (ω-1), 13.75 (ω) ppm.

IR [KBr]: 2958, 2929, 2858 (CH), 2099 (N_3), 1465, 1349, 1262 cm^{-1}.

1-Azido-octadecane (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (10)



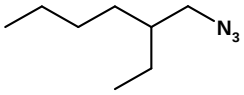
Yield = 19.2 g (65.2 mmol, 90.0 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.21 (t, 2H, α-CH_2, J=7.0 Hz), 1.58 (m_c, 2H, β-CH_2), 1.35-1.20 (m, 30H, bulk-CH_2), 0.87 (m, 3 H, CH_3, J=6.9 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =51.17 (α), 31.60 (ω-2), 29.84, 29.40(3), 29.34, 29.33, 29.30(2), 29.26, 29.17, 29.10, 28.85, 28.59 (bulk-CH_2), 26.24 (β), 22.38 (ω-1), 13.75 (ω) ppm.

IR [KBr]: 2925, 2854 (CH), 2096 (N_3), 1466, 1349, 1272, 1260, 721 cm^{-1}.

1-Azido-2-ethyl-hexane (11)



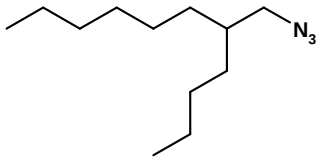
Yield = 12.3 g (67.3 mmol, 92.7 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.22 (d, 2H, α-CH_2, J=6.0 Hz), 1.48 (m_c, 1H, β-CH), 1.41-1.20 (m, 8H, bulk-CH_2), 0.88 (m_c, 6 H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =54.68 (α), 39.40 (β), 30.70 (δ), 28.54 (γ), 23.96 (γ'), 22.60 (ω-1), 13.63 (ω), 10.41 (δ') ppm.

IR [KBr]: 2959, 2930, 2860, 2871 (CH), 2099 (N_3), 1624, 1461, 1286, 1255, 1227, 920, 725 cm^{-1}.

1-Azido-2-butyl-octane (12)



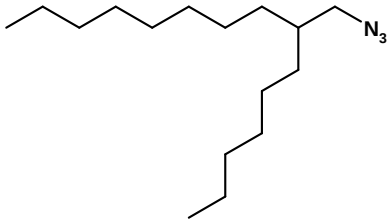
Yield = 13.8 g (65.3 mmol, 90.0 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.20 (d, 2H, α-CH_2, J=6.0 Hz), 1.52 (m_c, 1H, β-CH), 1.35-1.16 (m, 16H, bulk-CH_2), 0.88, 0.86 (2t, 2x3 H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =55.00 (α), 37.97 (β), 31.53, 31.51, 31.19, 29.29, 28.53, 26.28 (bulk-CH_2), 22.61, 22.30 (ω-1, ω'-1), 13.57, 13.52 (ω, ω') ppm.

IR [KBr]: 2958, 2929, 2859, 2875 (CH), 2098 (N_3), 1627, 1459, 1376, 1284, 1229, 921, 727 cm^{-1}.

1-Azido-2-hexyl-decane (13)



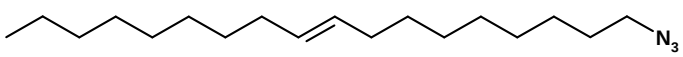
Yield = 16.5 g (65.3 mmol, 90.0 %), light-yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 3.19 (d, 2H, α-CH_2, J=6.0 Hz), 1.52 (m_c, 1H, β-CH), 1.38-1.17 (m, 24H, bulk-CH_2), 0.85 (t, 6 H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =55.14 (α), 38.00 (β), 31.63, 31.55, 31.54, 31.53, 29.65, 29.31, 29.28, 29.03, 26.33, 26.30 (bulk-CH_2), 22.36, 22.34 (ω-1, ω'-1), 13.72, 13.70 (ω, ω') ppm.

IR [KBr]: 2958, 2957, 2856 (CH), 2098 (N_3), 1638, 1461, 1459, 1378, 1285, 1022, 723 cm^{-1}.

(Z)-1-Azido-9-octadecene (zar azide) (Lutz & Zarafshani, 2008; Varma & Naicker, 1998) (14)



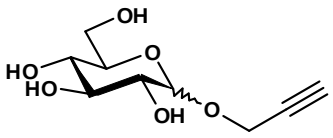
Yield = 18.3 g (62.3 mmol, 86.0 %), yellow oil.

^{1}H NMR (400MHz, $CDCl_3$) δ = 5.41-5.24 (m, 2H, CH=CH), 3.24 (t, 2H, α-CH_2, J=6.9 Hz), 1.99 (m_c, 4H, CH_2-C=C), 1.58 (m_c, 2H, β-CH_2), 1.28-1.20 (m, 22H, bulk-CH_2), 0.86 (m, 3 H, CH_3, J=7.0 Hz) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 130.23, 129.98 (HC=CH), 51.30 (α), 31.63 (ω-2), 29.48, 29.42, 29.24, 29.08, 29.03, 28.88, 28.84, 28.55 (bulk-CH_2), 26.91, 26.86 (CH_2-C=C), 26.41 (β), 22.36 (ω-1), 22.33 (CH_3), 13.72 (ω) ppm.

IR [KBr]: 2926, 2855 (CH), 2098 (N_3), 1648, 1459, 1371, 1226, 1075, 1040 cm^{-1}.

Propargyl glucopyranoside (anomeric mixtures) (Wen-Ya Lu, 2010) (15)

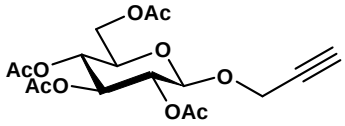


Yield = 18.7 g (78.3 mmol, 76.0 %), (α:β= 3/1), Orange syrup.

^{1}H NMR (400MHz, D_2O) δ = 4.93 (d, 1H, H-1α, J=3.5 Hz), 4.46 (d, 1/3H, H-1β, J=8.0 Hz), 4.21 (m, 2H, α CH_2), 3.80-3.18 (m, H-2 & H-3 & H-4 & H-5 & H-6a,b), 2.81 (t, 1/3H, alkyn-CH(β), J=2.4 Hz), 2.78 (t, 1H, alkyn-CH(α), J=2.4 Hz) ppm.

^{13}C NMR (100 MHz, D_2O) δ = 101.39 (C-1, β), 98.01 (C-1, α), 80.02 (C-2 chain, α), 79.82 (C-2 chain, β), 77.37, 77.02, 76.72, 76.54, 73.80, 73.71, 72.95, 71.82, 70.39, 70.23, 61.57 (C-6, β), 61.23 (C-6, α), 57.39 (C-1 chain, β), 55.71 (C-1 chain, α) ppm.

Propargyl 2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranoside (K. L. Chan, Coumbarides, G. S., Islam, S. & Wyatt, P. B., 2005; Laurent F. Bornaghi, 2005) (17)

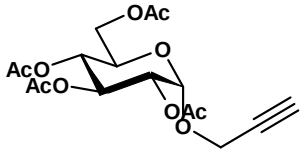


Yield = 10.2 g (43.8 mmol, 85.0 %), White solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 5.18 (t, 1H, H-3, J=9.5 Hz), 5.04 (t, 1H, H-4, J=9.5 Hz), 4.95 (dd, 1H, H-2, J=8.0/9.5 Hz), 4.74 (d, 1H, H-1, J=8.0 Hz), 4.31 (d, 2H, CH_2-alkyne), J=2.5 Hz), 4.23 (dd, 1H, H-6a, J=4.5/12.5 Hz), 4.10 (dd, 1H, H-6b, J=2.5/12.5 Hz), 3.68 (ddd, 1H, H-5, J=2.5/4.5/12.5 Hz), 2.44 (t, 1H, alkyn-CH, J=2.4 Hz), 2.05, 1.99, 1.96, 1.94 (4s, 4x3 H, Ac) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 170.97, 170.56, 169.75, 169.74 (CO), 98.11 (C-1), 78.00 (C-2 chain), 75.42 (C-3 alkyn), 72.60 (C-3), 71.75 (C-5), 70.79 (C-2), 68.13 (C-4), 61.54 (C-6), 55.69 (C-1 chain), 20.27, 20.23, 20.16, 20.14 (Ac) ppm.

Propargyl 2,3,4,6-tetra-*O*-acetyl-α-D-glucopyranoside (K. L. Chan, Coumbarides, G. S., Islam, S. & Wyatt, P. B., 2005; Laurent F. Bornaghi, 2005) **(18)**

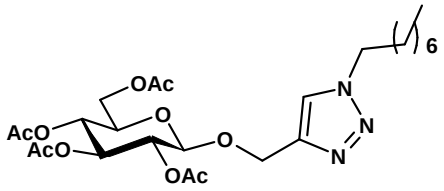


Yield = 3.2 g (8.3 mmol, 33.1 %), colorless syrup.

^{1}H NMR (400MHz, $CDCl_3$) δ = 5.46 (t, 1H, H-3, J=10.0 Hz), 5.24 (d, 1H, H-1, J=3.5 Hz), 5.06 (dd, 1H, H-4, J=10.0 Hz), 4.86 (dd, 1H, H-2, J=10.0 Hz), 4.25 (d, 2H, CH_2-alkyne), J=2.3 Hz), 4.21 (dd, 1H, H-6a, J=4.5/12.0 Hz), 4.12-4.01 (m, 2H, H-5 & H-6b, 2.42 (m_c, 1H, alkyn-CH), 2.06, 2.04, 1.99, 1.97 (4s, 4x3 H, Ac) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.07, 170.52, 170.46, 169.97 (CO), 94.58 (C-1), 78.09 (C-2 chain), 75.23 (C-3 alkyn), 70.32 (C-2), 69.80 (C-3), 68.26 (C-4), 67.69 (C-5), 61.53 (C-6), 55.21 (C-1 chain), 20.34, 20.30, 20.28, 20.23 (Ac) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-octyl-1,2,3-triazole (19)

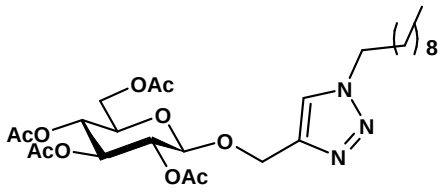


Yield = 2.8 g (5.1 mmol, 76.2 %), yellow wax.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.49 (bs, triazole), 5.08 (dd~t, H-3, J=9.5 Hz), 4.97 (dd~t, H-4, J=9.5 Hz), 4.88 (dd, H-2, J=9.5 Hz), 4.84-4.65 (m, 2H, OCH_2), 4.58 (d, H-1, J=8.0 Hz), 4.23 (t, 2H, α-CH_2), 4.15 (dd, H-6a, J=12.0 Hz), 4.03 (dd~bd, H-6b, J=12.0 Hz), 3.64 (ddd~bd, H-5, J=4.5 Hz), 1.96, 1.89, 1.86, 1.85 (4s, 4x3H, Ac), 1.77 (m, 2H, β-CH_2), 1.23-1.08 (m, 10H, bulk-CH_2), 0.74, (t, 3H, CH_3) ppm;

^{13}C NMR (100 MHz, $CDCl_3$) δ = 170.66, 170.19, 169.51, 169.39 (CO), 99.54 (C-1), 72.37 (C-3), 71.47 (C-5), 70.82 (C-2), 67.92 (C-4), 62.44 (O-CH_2), 61.38 (C-6), 49.93 (α), 31.14 (ω-2), 29.63, 28.36, 28.28 (bulk-CH_2), 25.81, (β), 21.88 (ω-1), 20.04, 19.93, 19.88, 19.87 (Ac), 13.32 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-decyl-1,2,3-triazole (20)

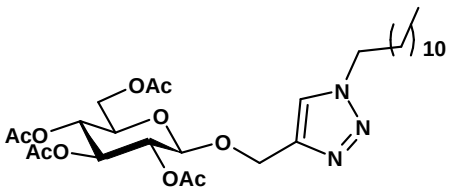


Yield = 2.6 g (4.6 mmol, 78.7 %), orange syrup.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.59 (bs, triazole), 5.17 (dd, H-3, J=9.5 Hz), 5.06 (dd~t, H-4, J=9.5 Hz), 4.98 (dd, H-2, J=9.5 Hz), 4.93-4.77 (m, 2H, OCH_2), 4.67 (d, H-1, J=8.0 Hz), 4.33 (m_c, 2H, α-CH_2), 4.24 (dd, H-6a, J=12.0 Hz), 4.12 (dd~bd, H-6b, J=12.0 Hz), 3.71 (ddd~bd, H-5, J~ 4.0 Hz), 2.05, 1.99, 1.97, 1.95 (4s, 4x3H, Ac), 1.87 (m_c, 2H, β-CH_2), 1.32-1.18 (m, 14H, bulk-CH_2), 0.83 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.67, 170.20, 169.54, 169.42 (CO), 122.98 (C=CH triazole), 99.59 (C-1), 72.41 (C-3), 71.49 (C-5), 70.88 (C-2), 67.97 (C-4), 62.54 (O-CH_2), 61.41 (C-6), 49.91 (α), 31.22 (ω-2), 29.67, 28.84, 28.75, 28.60, 28.36 (bulk-CH_2), 25.85 (β), 21.98 (ω-1), 20.05, 19.94, 19.69(2) (Ac), 13.39 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-dodecyl-1,2,3-triazole (21)



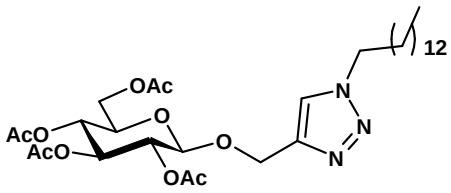
Yield = 2.4 g (4.1 mmol, 76.7 %), light orange solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.50 (s, triazole), 5.17 (dd~t, H-3, J=9.5 Hz), 5.07 (dd~t, H-4, J=10.0 Hz), 4.99 (dd, H-2, J=9.5 Hz), 4.93 (d, 1H, OCH_2-a, J=12.5 Hz), 4.82 (d, 1H, OCH_2-b, J=12.0 Hz), 4.68 (d, H-1, J=8.0 Hz), 4.33 (t, 2H, α-CH_2), 4.24

(dd, H-6a, J=12.0 Hz), 4.14 (dd, H-6b, J=12.0 Hz), 3.72 (ddd, H-5, J=5.0 Hz), 2.07, 2.00, 1.97, 1.96 (4s, 4x3H, Ac), 1.88 (m_c, 2H, β-CH_2), 1.34-1.18 (m, 18H, bulk-CH_2), 0.86 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.05, 170.59, 169.85, 169.76 (CO), 144.34 (triazole-C), 122.68 (triazole-CH), 99.92 (C-1), 72.69 (C-3), 71.81 (C-5), 71.15 (C-2), 68.22 (C-4), 62.89 (O-CH_2), 61.69 (C-6), 50.21 (α), 31.57 (ω-2), 29.99, 29.26 (2), 29.19, 29.05, 28.99, 28.66 (bulk-CH_2), 26.16 (β), 22.31 (ω-1), 20.38, 20.27, 20.22 (2) (Ac), 13.70 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-tetradecyl-1,2,3-triazole (22)

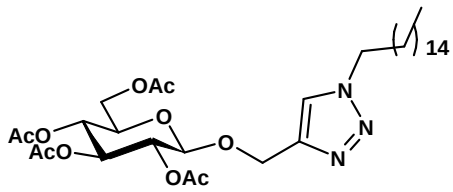


Yield = 3.8 g (6.0 mmol, 78.0 %), light orange solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.47 (s, triazole), 5.17 (dd~t, H-3, J=9.5 Hz), 5.07 (dd~t, H-4, J=9.5 Hz), 4.99 (dd, H-2, J=9.5 Hz), 4.91 (d, 1H, OCH_2-a), 4.80 (d, 1H, OCH_2-b), 4.66 (d, H-1, J=8.0 Hz), 4.31 (t, 2H, α-CH_2), 4.25 (dd, H-6a, J=12.5 Hz), 4.12 (dd, H-6b, J=12.5 Hz), 3.71 (ddd, H-5, J=5.0 Hz), 2.05, 2.00, 1.97, 1.96 (4s, 4x3H, Ac), 1.87 (m_c, 2H, β-CH_2), 1.33-1.17 (m, 22H, bulk-CH_2), 0.85 (t, 3H, CH_3) ppm.

^{13}C NMR (150 MHz, $CDCl_3$) δ = 171.67, 170.20, 169.44, 169.37 (CO), 99.86 (C-1), 72.74 (C-3), 71.96 (C-5), 71.18 (C-2), 68.27 (C-4), 63.01 (O-CH_2), 61.81 (C-6), 50.44 (α), 31.87 (ω-2), 30.27, 29.65, 29.62 (2), 29.58, 29.51, 29.37, 29.33, 28.99 (bulk-CH_2), 26.59 (β), 22.67 (ω-1), 20.82, 20.71, 20.59 (2) (Ac), 13.11 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-hexadecyl-1,2,3-triazole (23)

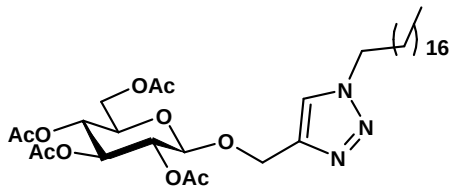


Yield = 4.0 g (6.1 mmol, 79 %), slightly colored solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.51 (s, triazole), 5.19 (dd~t, H-3, J=9.5 Hz), 5.09 (dd~t, H-4, J=9.5 Hz), 5.01 (dd, H-2, J=9.5 Hz), 4.93 (d, 1H, OCH_2-a), 4.81 (d, 1H, OCH_2-b), 4.68 (d, H-1, J=8.0 Hz), 4.32 (t, 2H, α-CH_2), 4.26 (dd, H-6a, J=12.5 Hz), 4.14 (dd, H-6b, J=12.5 Hz), 3.72 (ddd, H-5, J=2.0 Hz), 2.08, 2.01, 1.98, 1.97 (4s, 4x3H, Ac), 1.88 (m_c, 2H, β-CH_2), 1.34-1.21 (m, 26H, bulk-CH_2), 0.86 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.17, 170.72, 169.98, 169.90 (CO), 100.04 (C-1), 72.72 (C-3), 71.87 (C-5), 71.17 (C-2), 68.25 (C-4), 62.94 (O-CH_2), 61.73 (C-6), 50.38 (α), 31.65 (ω-2), 30.02, 29.40 (2), 29.37 (2), 29.33, 29.55, 29.12, 29.08, 28.72 (bulk-CH_2), 26.22 (β), 22.37 (ω-1), 20.45, 20.35, 20.28 (2) (Ac), 13.76 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-octadecyl-1,2,3-triazole (24)

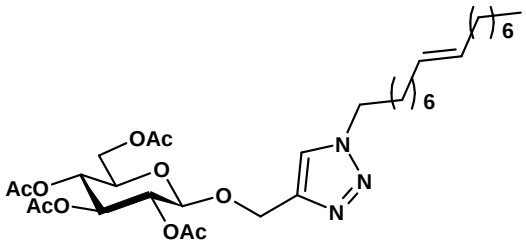


Yield = 3.6 g (5.3 mmol, 79 %), fine white powder.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.48 (s, triazole), 5.16 (dd~t, H-3, J=9.5 Hz), 5.06 (dd~t, H-4, J=10.0 Hz), 4.98 (dd, H-2, J=9.5 Hz), 4.89 (d, 1H, OCH_2-a), 4.79 (d, 1H, OCH_2-b), 4.66 (d, H-1, J=8.0 Hz), 4.30 (t, 2H, α-CH_2), 4.24 (dd, H-6a, J=12.5 Hz), 4.12 (dd, H-6b, J=12.5 Hz), 3.70 (ddd, H-5, J=4.5 Hz), 2.05, 1.98, 1.95, 1.94 (4s, 4x3H, Ac), 1.80 (m_c, 2H, β-CH_2), 1.31-1.14 (m, 30H, bulk-CH_2), 0.83 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.06, 170.59, 169.85, 169.76 (CO), 144.34 (triazole-C), 122.68 (triazole-CH), 99.90 (C-1), 72.68 (C-3), 71.79 (C-5), 71.13 (C-2), 62.85 (O-CH_2), 68.20 (C-4), 61.67 (C-6), 50.19 (α), 31.59 (ω-2), 29.97, 29.35 (3), 29.34, 29.33, 29.31 (2), 29.26, 29.19, 28.66 (bulk-CH_2), 26.15 (β), 22.31 (ω-1), 20.35, 20.25, 20.20 (2) (Ac), 13.69 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-(E)-9-octadecenyl-1,2,3-triazole (25)



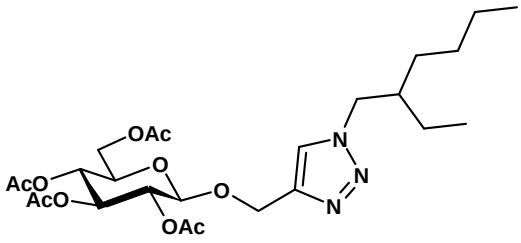
Yield = 3.5 g (5.1 mmol, 76 %), orange syrup.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.46 (s, triazole), 5.31 (m_c, 2H, HC=CH), 5.17 (t, H-3, J=9.5 Hz), 5.06 (t, H-4, J=10.0 Hz), 4.98 (t, H-2, J=9.5 Hz), 4.89 (d, 1H, OCH_2-a),

4.81 (d, 1H, OCH_2-b), 4.67 (d, H-1, J=8.0 Hz), 4.33 (t, 2H, α-CH_2), 4.25 (dd, H-6a, J=12.0 Hz), 4.10 (dd, H-6b, J=12.0 Hz), 3.71 (ddd, H-5, J=5.0 Hz), 2.07 (m_c, 4H, CH_2-CH=CH), 1.99, 1.97, 1.96, 1.94 (4s, 4x3H, Ac), 1.86 (m_c, 2H, β-CH_2), 1.34-1.19 (m, 22H, bulk-CH_2), 0.82 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.10, 170.66, 169.89, 169.81 (CO), 144.40 (triazole-C), 130.29, 129.93 (HC=CH), 122.70 (triazole-CH), 99.99 (C-1), 72.74 (C-3), 71.68 (C-5), 71.20 (C-2), 68.27 (C-4), 62.94 (O-CH_2), 61.74 (C-6), 50.24 (α), 31.63 (ω-2), 30.04, 29.47, 29.41, 29.23, 29.03, 29.02 (2), 28.89, 28.69 (bulk-CH_2), 26.92, 26.87 (CH_2-HC=CH), 26.21 (β), 22.36 (ω-1), 20.42, 20.32, 20.26 (2) (Ac), 13.74 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-(2-ethyl-hexyl)-1,2,3-triazole (26)



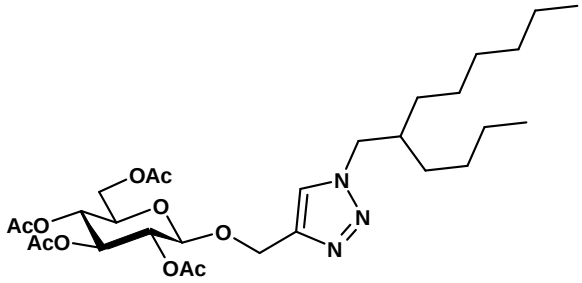
Yield = 2.9 g (5.3 mmol, 80 %), orange syrup.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.49 (s, triazole), 5.13 (dd~t, H-3, J=10.0 Hz), 5.03 (dd~t, H-4, J=10.0 Hz), 4.95 (dd, H-2, J=10.0 Hz), 4.87 (d, 1H, OCH_2-a, J=12.0 Hz), 4.77 (d, 1H, OCH_2-b, J=12.0 Hz), 4.62 (d, H-1, J=8.0 Hz), 4.21 (d, H-6a, J=4.5 Hz), 4.20 (m_c, 2H, α-CH_2), 4.08 (dd~bd, H-6b, J=4.5 Hz), 3.67 (m_c, H-5), 2.03, 1.96, 1.93, 1.90 (4s, 4x3H, Ac), 1.85 (m_c, β-CH), 1.22 (m_c, 8H, bulk-CH_2), 0.83, 0.81 (2t, 4x3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 170.59, 170.11, 169.38, 169.28 (CO), 143.82 (triazole-C), 123.04 (triazole-CH), 99.73 (C-1), 72.70 (C-3), 71.82 (C-5), 71.15 (C-2),

68.24 (C-4), 62.86 (O-CH_2), 61.76 (C-6), 53.55 (α), 40.26 (β), 30.28 (δ), 28.38 (γ), 23.56 (γ'), 22.75 (ω-1), 20.68, 20.55, 20.51 (2) (Ac), 13.90 (ω), 10.36 (δ') ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-(2-butyl-octyl)-1,2,3-triazole (27)

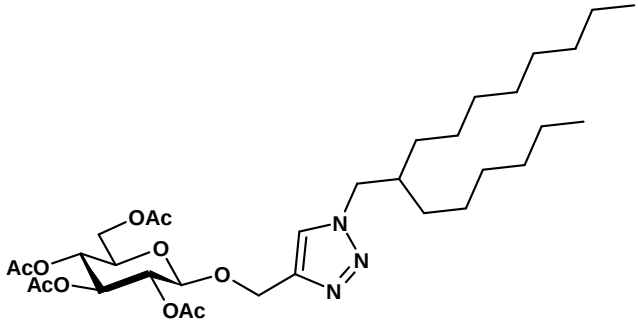


Yield = 2.9 g (4.9 mmol, 73 %), orange syrup.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.48 (s, triazole), 5.17 (dd~t, H-3, J=9.5 Hz), 5.07 (dd~t, H-4, J=10.0 Hz), 4.99 (dd, H-2, J=9.5 Hz), 4.91 (bd, 1H, OCH_2-a, J=11.0 Hz), 4.81 (bd, 1H, OCH_2-b, J=11.0 Hz), 4.66 (d, H-1, J=8.0 Hz), 4.25 (dd, H-6a, J=12.5 Hz), 4.23 (d, 2H, α-CH_2), 4.12 (dd, H-6b, J=12.5 Hz), 3.71 (ddd, H-5, J=2.0 Hz), 2.06, 1.99, 1.96, 1.94 (4s, 4x3H, Ac), 1.88 (m_c, β-CH), 1.31-1.15 (m, 16H, bulk-CH_2), 0.84 (m_c, 6H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.05, 170.57, 169.85, 169.75 (CO), 99.90 (C-1), 72.69 (C-3), 71.83 (C-5), 71.13 (C-2), 68.22 (C-4), 62.71 (O-CH_2), 61.68 (C-6), 53.94 (α), 38.73 (β), 31.41, 30.90, 30.53, 29.14, 28.07 (bulk-CH_2), 25.89 (γ), 22.48, 22.23 (ω-1, ω'-1), 20.38, 20.27, 20.21 (2) (Ac), 13.65, 13.57 (ω, ω') ppm.

4-(2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyl-oxymethyl)-1-(2-hexyl-decyl)-1,2,3-triazole (28)

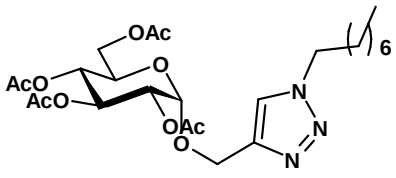


Yield = 3.3 g (5.0 mmol, 75 %), orange syrup.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.43 (s, triazole), 5.17 (dd~t, H-3, J=10.0 Hz), 5.04 (dd~t, H-4, J=10.0 Hz), 4.96 (dd, H-2, J=9.5 Hz), 4.89 (d, 1H, OCH_2-a, J=12.5 Hz), 4.78 (d, 1H, OCH_2-b, J=12.5 Hz), 4.64 (d, H-1, J=8.0 Hz), 4.23 (dd, H-6a, J=12.0 Hz), 4.20 (m_c, 2H, α-CH_2), 4.10 (dd, H-6b, J=12.0 Hz), 3.70 (ddd, H-5, J=2.0 Hz), 2.04, 1.97, 1.94, 1.92 (4s,

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.03, 170.55, 169.83, 169.71 (CO), 144.15 (triazole-C), 123.23 (triazole-CH), 99.84 (C-1), 72.68 (C-3), 71.77 (C-5), 71.12 (C-2), 68.19 (C-4), 62.76 (O-CH_2), 61.65 (C-6), 53.78 (α), 38.74 (β), 31.49, 31.37 (ω-2, ω'-2), 30.84 (2), 29.44, 29.12 (2), 28.87 (bulk-CH_2), 25.87, 25.83 (γ, γ'), 22.24, 22.19 (ω-1, ω'-1), 20.32, 20.21, 20.16 (2) (Ac), 13.64, 13.61 (ω, ω') ppm.

4-(2,3,4,6-tetra-*O*-acetyl-α-D-glucopyranosyl-oxymethyl)-1-octyl-1,2,3-triazole (29)

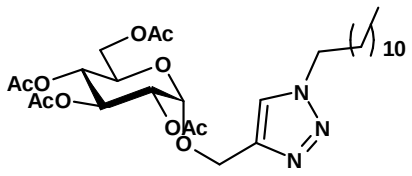


Yield = 2.7 g (5.0 mmol, 75 %), light yellow wax.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.56 (bs, triazole), 5.45 (dd~t, H-3, J=9.5 Hz), 5.18 (d, H-1, J=3.5 Hz), 5.04 (dd~t, H-4, J=10.0 Hz), 4.86 (dd, H-2, J=10.0 Hz), 4.82 (bd, 1H, OCH_2-a, J=11.5 Hz), 4.64 (bd, 1H, OCH_2-b, J=11.5 Hz), 4.33 (d, 2H, α-CH_2), 4.23 (dd, H-6a, J=12.0 Hz), 4.11-4.02 (m, 2H, H-5 & H-6b), 2.07, 1.99, 1.98, 1.96 (4s, 4x3H, Ac), 1.89 (m_c, 2H, β-CH_2), 1.34-1.19 (m, 10H, bulk-CH_2), 0.84 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.60, 170.08, 196.98, 169.62 (CO), 144.12 (triazole-C), 122.78 (C=CH triazole), 98.89 (C-1), 72.61 (C-3), 71.77 (C-5), 71.18 (C-2), 68.17 (C-4), 62.84 (O-CH_2), 61.71 (C-6), 50.23 (α), 31.14 (ω-2), 29.87, 29.14, 28.90, (bulk-CH_2), 26.15 (β), 22.28 (ω-1), 20.35, 20.28, 20.12 (2) (Ac), 13.69 (ω) ppm.

4-(2,3,4,6-tetra-*O*-acetyl-α-D-glucopyranosyl-oxymethyl)-1-dodecyl-1,2,3-triazole (30)



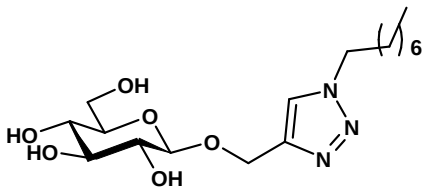
Yield = 3.0 g (5.0 mmol, 75 %), light orange solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.50 (s, triazole), 5.42 (dd~t, H-3, J=9.5 Hz), 5.15 (d, H-1, J=4.0 Hz), 5.02 (dd, H-4, J=9.5 Hz), 4.83 (dd, 1H, H-2, J=10.0 Hz), 4.77 (d, 1H, OCH_2-a, J=12.0 Hz), 4.61 (d, 1H, OCH_2-b, J=12.0 Hz), 4.29 (t, 2H, α-CH_2), 4.20 (dd, H-6a, J=12.0 Hz), 4.08-3.98 (m, 2H, H-5 & H-6b), 2.04, 1.95(2), 1.93 (4s, 4x3H, Ac), 1.86 (m_c, 2H, β-CH_2), 1.30-1.13 (m, 18H, bulk-CH_2), 0.81 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 171.56, 170.00, 196.94, 169.48 (CO), 143.36 (triazole-C), 122.49 (C=CH triazole), 95.06 (C-1), 70.50 (C-2), 69.97 (C-3), 68.38 (C-4), 67.36 (C-5), 61.65 (O-CH_2), 61.36 (C-6), 50.34 (α), 31.77 (ω-2), 30.23, 29.47(2),

29.41, 29.27, 29.20, 28.89 (bulk-CH_2), 26.41 (β), 22.56 (ω-1), 20.64, 20.55(2), 20.50 (Ac), 14.00 (ω) ppm.

4-(β-D-glucopyranosyl-oxymethyl)-1-octyl-1,2,3-triazole (31)



Yield = 1.4 g (3.7 mmol, 96 %, 72 % overall), orange syrup.

$[\alpha]_D^{25}$ = -28.3 (c = 0.36, MeOH).

IR [KBr]: 3380 (OH), 2956, 2928, 2858 (CH), 1647, 1458, 1376, 1158, 1078, 1040 cm^{-1}.

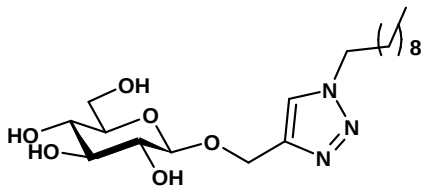
^1H NMR (400MHz, CD_3OD) δ = 7.97 (s, triazole), 4.91 (d, 1H, OCH_2-a), 4.73 (d, 1H, OCH_2-b), 4.35 (d, 1H, H-1, J=8.0 Hz), 4.34 (t, 2H, α-CH_2), 3.84 (dd~bd, H-6a, J=12.0 Hz), 3.64 (dd, H-6b, J=12.0 Hz), 3.38-3.22 (m, 3H, H-3, H-4 & H-5), 3.19 (dd, H-2, J=9.0 Hz), 1.92 (m_c, 2H, β-CH_2), 1.24 (m_c, 10H, , bulk-CH_2), 0.83 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 145.46 (triazole-C), 125.21 (C=CH triazole), 103.45 (C-1), 77.85, 77.80 (C-3 & C-5), 74.86 (C-2), 71.49 (C-4), 62.96 (O-CH_2), 62.68 (C-6), 51.28 (α), 32.76 (ω-2), 31.16, 30.09, 29.94 (bulk-CH_2), 27.35 (β), 23.54 (ω-1), 14.41 (ω) ppm.

HRMS(ESI): Calcd for $C_{17}H_{31}N_3O_6$ (M+H) 374.2291, found 374.2334; (M+Na) 396.2111 found 396.2153; Calcd for $^{12}C_{16}{}^{13}CH_{31}N_3O_6$ (M+H) 375.2325 (19 %), found 375.2363 (21 %); (M+Na) 397.2144 (19 %), found 397.2174 (20 %).

Elemental Anal. for $C_{17}H_{31}N_3O_6$ Calcd: C 54.68 %, H 8.37 %, N 11.25 %. Found: C 54.90 %, H 8.94 %, N 11.28 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-decyl-1,2,3-triazole (32)



Yield = 1.5 g (3.7 mmol, 92 %, 72 % overall), light orange syrup.

$[\alpha]_D^{25}$ = -26.8 (c = 0.26, MeOH).

IR [KBr]: 3386 (OH), 2925, 2928, 2855 (CH), 1639, 1447, 1370, 1227, 1161, 1077, 1039 cm^{-1}.

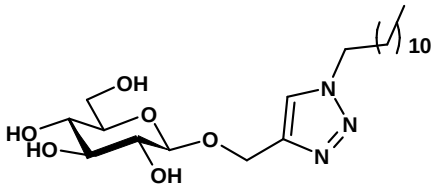
^{1}H NMR (400MHz, CD_3OD) δ = 8.00 (s, triazole), 4.95 (d, 1H, OCH_2-a, J=12.5 Hz), 4.77 (d, 1H, OCH_2-b, J=12.5 Hz), 4.38 (t, 2H, α-CH_2), 4.37 (d, 1H, H-1, J=8.0 Hz), 3.88 (dd, H-6a, J=12.0 Hz), 3.67 (dd, H-6b, J=12.0 Hz), 3.47-3.25 (m, 3H, H-3, H-4 & H-5), 3.21 (dd, 1H, H-2, J=9.0 Hz), 1.89 (m_c, 2H, β-CH_2), 1.28 (m_c, 14H, , bulk-CH_2), 0.89 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 145.66 (triazole-C), 125.22 (C=CH triazole), 103.63 (C-1), 78.06, 77.98 (C-3 & C-5), 75.03 (C-2), 71.63 (C-4), 63.04 (O-CH_2), 62.81 (C-6), 51.37 (α), 33.03 (ω-2), 31.28, 30.60, 30.56, 30.40, 30.09 (bulk-CH_2), 27.47 (β), 23.71 (ω-1), 14.42 (ω) ppm.

HRMS(ESI): Calcd for $C_{19}H_{35}N_3O_6$ (M+H) 402.2604, found 402.2644; (M+Na) 424.2424, found 424.2460; Calcd for $^{12}C_{18}{}^{13}CH_{35}N_3O_6$ (M+H) 403.2638 (21 %), found 403.2672 (23 %); (M+Na) 425.2457 (21 %), found 425.2484 (20 %).

Elemental Anal. for $C_{19}H_{35}N_3O_6$ Calcd: C 56.84 %, H 8.79 %, N 10.47 %. Found: C 56.78 %, H 9.30 %, N 10.35 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-dodecyl-1,2,3-triazole(Wen-Ya Lu, 2010) (33)



Yield = 1.7 g (3.9 mmol, 88 %, 67 % overall), light orange syrup.

$[\alpha]_D^{25}$ = -26.3 (c = 0.2, MeOH).

IR [KBr]: 3386 (OH), 2923, 2852 (CH), 1655, 1458, 1365, 1227, 1161, 1102, 1075, 1056 cm^{-1}.

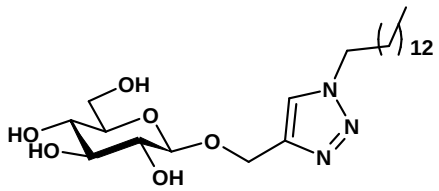
^{1}H NMR (400MHz, CD_3OD) δ = 8.02 (s, triazole), 4.97 (d, 1H, OCH_2-a, J=12.5 Hz), 4.79 (d, 1H, OCH_2-b, J=12.5 Hz), 4.40 (t, 2H, α-CH_2), 4.39 (d, 1H, H-1, J=8.0 Hz), 3.90 (dd, H-6a, J=12.5 Hz), 3.68 (dd, H-6b, J=12.5 Hz), 3.39-3.25 (m, 3H, H-3, H-4 & H-5), 3.22 (dd, 1H, H-2, J=9.0 Hz), 1.90 (m_c, 2H, β-CH_2), 1.40-1.23 (m, 18H, , bulk-CH_2), 0.89 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 145.91 (triazole-C), 125.61 (C=CH triazole), 103.70 (C-1), 77.92, 77.89 (C-3 & C-5), 74.93 (C-2), 71.54 (C-4), 63.04 (O-CH_2), 62.73 (C-6), 51.26 (α), 32.87 (ω-2), 31.10, 30.58, 30.57, 30.51, 30.40, 30.28, 29.96 (bulk-CH_2), 27.30 (β), 23.50 (ω-1), 14.37 (ω) ppm.

HRMS(ESI): Calcd for $C_{21}H_{39}N_3O_6$ (M+H) 430.2917, found 430.2948; (M+Na) 452.2737, found 452.2765; Calcd for $^{12}C_{20}{}^{13}CH_{39}N_3O_6$ (M+H) 431.2951 (23 %), found 431.2978 (26 %); (M+Na) 453.2770 (23 %), found 453.2803 (24 %).

Elemental Anal. for $C_{21}H_{39}N_3O_6$ Calcd: C 58.72 %, H 9.15 %, N 9.78 %. Found: C 58.61 %, H 10.21 %, N 9.69 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-tetradecyl-1,2,3-triazole (34)



Yield = 2.5 g (5.5 mmol, 90 %, 70 % overall), light orange solid.

$[\alpha]_D^{25}$ = -26.1 (c = 0.29, MeOH).

IR [KBr]: 3404 (OH), 2924, 2851 (CH), 1639, 1459, 1355, 1223, 1163, 1112, 1081, 1043 cm^{-1}.

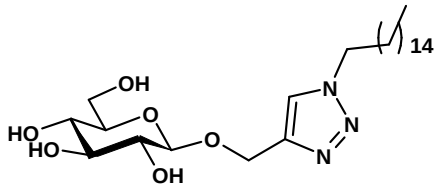
^{1}H NMR (400MHz, CD_3OD) δ = 8.01 (s, triazole), 4.95 (d, 1H, OCH_2-a, J=12.0 Hz), 4.78 (d, 1H, OCH_2-b, J=12.0 Hz), 4.38 (t, 2H, α-CH_2), 4.37 (d, 1H, H-1, J=8.0 Hz), 3.88 (dd~bd, H-6a, J=12.0 Hz), 3.67 (dd, H-6b, J=12.0 Hz), 3.37-3.24 (m, 3H, H-3, H-4 & H-5), 3.20 (dd, 1H, H-2, J=9.5 Hz), 1.89 (m_c, 2H, β-CH_2), 1.37-1.22 (m, 22H, bulk-CH_2), 0.88 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 125.27 (C=CH triazole), 103.63 (C-1), 78.04, 77.97 (C-3 & C-5), 75.02 (C-2), 71.62 (C-4), 63.08 (O-CH_2), 62.80 (C-6), 51.40 (α), 33.06 (ω-2), 31.27, 30.78, 30.76, 30.74, 30.72, 30.65, 30.55, 30.45, 30.09 (bulk-CH_2), 27.48 (β), 23.50 (ω-1), 14.36 (ω) ppm.

HRMS(ESI): Calcd for $C_{23}H_{43}N_3O_6$ (M+H) 458.3230, found 458.3222; (M+Na) 480.3050, found 480.3041; Calcd for $^{12}C_{22}{}^{13}CH_{43}N_3O_6$ (M+H) 459.3264 (26 %), found 459.3245 (28 %); (M+Na) 481.3083 (26 %), found 481.3062 (30 %).

Elemental Anal. for $C_{23}H_{43}N_3O_6$ Calcd: C 60.37 %, H 9.47 %, N 9.18 %. Found: C 59.67 %, H 9.57 %, N 9.10 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-hexadecyl-1,2,3-triazole (35)



Yield = 2.7 g (5.6 mmol, 93 %, 73 % overall), light orange solid.

$[\alpha]_D^{25}$ = -23.1 (c = 0.38, MeOH).

IR [KBr]: 3404 (OH), 2923, 2852 (CH), 1638, 1467, 1364, 1220, 1164, 1081, 1053, 1043 cm^{-1}.

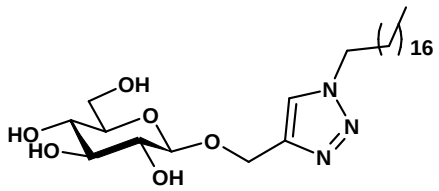
^{1}H NMR (400MHz, CD_3OD) δ = 8.02 (s, triazole), 4.97 (d, 1H, OCH_2-a, J=12.5 Hz), 4.78 (d, 1H, OCH_2-b, J=12.5 Hz), 4.40 (t, 2H, α-CH_2), 4.38 (d, 1H, H-1, J=8.0 Hz), 3.89 (dd, H-6a, J=12.0 Hz), 3.68 (dd, H-6b, J=12.0 Hz), 3.38-3.25 (m, 3H, H-3, H-4 & H-5), 3.18 (dd, 1H, H-2, J=9.0 Hz), 1.90 (m_c, 2H, β-CH_2), 1.37-1.24 (m, 26H, bulk-CH_2), 0.90 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 125.74 (C=CH triazole), 103.97 (C-1), 78.27, 78.19 (C-3 & C-5), 75.23 (C-2), 71.82 (C-4), 63.18 (O-CH_2), 62.94 (C-6), 51.45 (α), 33.04 (ω-2), 31.25, 30.75, 30.74 (2), 30.73, 30.71, 30.69, 30.62, 30.52, 30.43, 30.06 (bulk-CH_2), 27.43 (β), 23.65 (ω-1), 14.31 (ω) ppm.

HRMS(ESI): Calcd for $C_{25}H_{47}N_3O_6$ (M+H) 486.3543, found 486.1110; (M+Na) 508.3363, found 508.3203; Calcd for $^{12}C_{24}{}^{13}CH_{47}N_3O_6$ (M+H) 487.3577 (28 %), found 487.1100 (30 %); (M+Na) 509.3396 (28 %), found 509.2851 (38 %).

Elemental Anal. for $C_{25}H_{47}N_3O_6$ Calcd: C 61.83 %, H 9.75 %, N 8.65 %. Found: C 61.92 %, H 10.85 %, N 8.58 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-octadecyl-1,2,3-triazole (36)



Yield = 1.5 g (2.9 mmol, 92 %, 73 % overall), light orange solid.

$[\alpha]_D^{25}$ = -21.2 (c = 0.33, MeOH).

IR [KBr]: 3386 (OH), 2928, 2857 (CH), 1640, 1440, 1374, 1227, 1159, 1077, 1040 cm^{-1}.

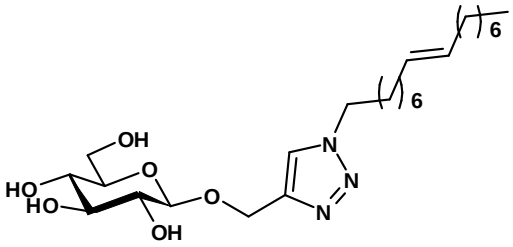
^{1}H NMR (400MHz, CD_3OD) δ = 8.02 (s, triazole), 4.97 (d, 1H, OCH_2-a, J=12.5 Hz), 4.78 (d, 1H, OCH_2-b, J=12.5 Hz), 4.40 (t, 2H, α-CH_2), 4.38 (d, 1H, H-1, J=8.0 Hz), 3.89 (dd, H-6a, J=12.0 Hz), 3.68 (dd, H-6b, J=12.0 Hz), 3.38-3.25 (m, 3H, H-3, H-4 & H-5), 3.21 (dd, 1H, H-2, J=9.0 Hz), 1.90 (m_c, 2H, β-CH_2), 1.35-1.24 (m, 30H, bulk-CH_2), 0.90 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 146.22 (triazole-C), 125.64 (C=CH triazole), 103.95 (C-1), 78.25, 78.17 (C-3 & C-5), 75.21 (C-2), 71.80 (C-4), 63.15 (O-CH_2), 62.91 (C-6), 51.42 (α), 33.02 (ω-2), 31.23, 30.72, 30.71 (3), 30.69, 30.66, 30.59, 30.50, 30.40 (bulk-CH_2), 27.40 (β), 23.63 (ω-1), 14.30 (ω) ppm.

HRMS(ESI): Calcd for $C_{27}H_{51}N_3O_6$ (M+H) 514.3856, found 514.3850; (M+Na) 536.3676, found 536.3666; Calcd for $^{12}C_{26}{}^{13}CH_{51}N_3O_6$ (M+H) 515.3890 (30 %), found 515.3882 (31 %); (M+Na) 537.3709 (30 %), found 537.3699 (31 %).

Elemental Anal. for $C_{27}H_{51}N_3O_6$ Calcd: C 63.13 %, H 10.01 %, N 8.18 %. Found: C 62.60 %, H 11.61 %, N 8.00 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-(E)-9-octadecenyl-1,2,3-triazole (37)



Yield = 0.97 g (1.9 mmol, 90 %, 64 % overall), colorless wax.

$[\alpha]_D^{25}$ = -18.0 (c = 0.33, MeOH).

IR [KBr]: 3386 (OH), 2926, 2855 (CH), 1649, 1459, 1371, 1226, 1160, 1077, 1040 cm^{-1}.

^{1}H NMR (400MHz, CD_3OD) δ = 8.04 (s, triazole), 5.39 (m_c, 2H, HC=CH), 4.97 (d, 1H, OCH_2-a, J=12.5 Hz), 4.78 (d, 1H, OCH_2-b, J=12.5 Hz), 4.40 (t, 2H, α-CH_2), 4.38 (d, 1H, H-1, J=8.0 Hz), 3.71 (dd~bd, H-6a, J=12.0 Hz), 3.71 (dd~bd, H-6b, J=12.0 Hz), 3.44-3.30 (m, 3H, H-3, H-4 & H-5), 3.25 (dd~t, 1H, H-2, J=9.0 Hz), 2.03 (4H, CH_2-CH=CH_2), 1.89 (m_c, 2H, β-CH_2), 1.44-1.26 (m, 22H, bulk-CH_2), 0.90 (t, 3H, CH_3) ppm.

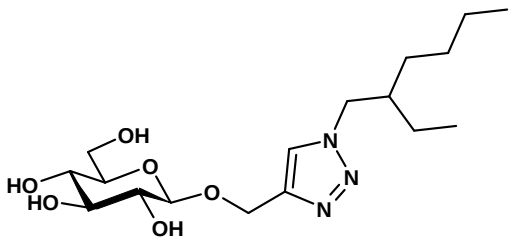
^{13}C NMR (100 MHz, CD_3OD) δ = 146.04 (triazole-C), 133.24, 131.18 (Z-CH=CH), [131.86, 131.81 (E-CH=CH)], 125.50 (C=CH triazole), 103.80 (C-1), 78.05, 77.98 (C-

3 & C-5), 75.03 (C-2), 71.63 (C-4), 63.09 (O-CH_2), 62.80 (C-6), 51.33 (α), 32.95 (ω-2), 31.95, 31.18, 30.74, 30.72, 30.52, 30.37, 30.34, 30.25, 30.19, 30.02 (bulk-CH_2), 28.07, 28.04 (CH_2-CH=CH), 27.39 (β), 23.59 (ω-1), 14.42 (ω) ppm.

HRMS(ESI): Calcd for $C_{27}H_{49}N_3O_6$ (M+H) 512.3700, found 512.3695; (M+Na) 534.3519, found 534.3511; Calcd for $^{12}C_{26}{}^{13}CH_{49}N_3O_6$ (M+H) 513.3733 (30 %), found 513.3721 (30 %); (M+Na) 535.3552 (30 %), found 535.3539 (30 %).

Elemental Anal. for $C_{27}H_{49}N_3O_6$ Calcd: C 63.38 %, H 9.65 %, N 8.21 %. Found: C 62.64 %, H 11.37 %, N 7.99 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-(2-ethyl-hexyl)-1,2,3-triazole (38)



Yield = 1.4 g (3.7 mmol, 96 %, 72 % overall orange syrup.

$[\alpha]_D^{25}$ = -29.0 (c = 0.35, MeOH).

IR [KBr]: 3378 (OH), 2960, 2931, 2874 (CH), 1643, 1450, 1377, 1227, 1158, 1077, 1040 cm^{-1}.

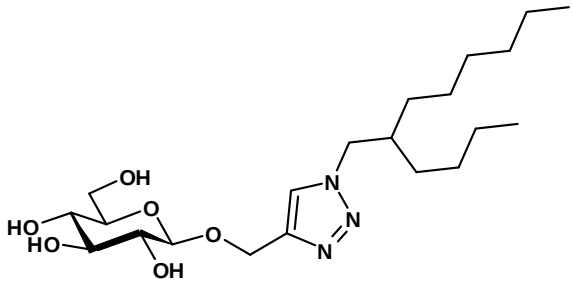
^{1}H NMR (400MHz, CD_3OD) δ = 8.04 (s, triazole), 4.98 (d, 1H, OCH_2-a, J=12.0 Hz), 4.80 (d, 1H, OCH_2-b, J=12.0 Hz), 4.41 (d, 1H, H-1, J=8.0 Hz), 4.32 (d, 2H, α-CH_2), 3.91 (dd~bd, H-6a, J=12.0 Hz), 3.70 (dd~bd, H-6b, J=12.0 Hz), 3.44-3.29 (m, 3H, H-3, H-4 & H-5), 3.26 (dd~t, H-2, J=9.0 Hz), 1.90 (m_c, 2H, β-CH_2), 1.38-1.22 (m, 8H, , bulk-CH_2), 0.92, 0.89 (2t, 2x3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 146.04 (triazole-C), 126.28 (C=CH triazole), 103.73 (C-1), 78.06, 77.99 (C-3 & C-5), 75.02 (C-2), 71.64 (C-4), 63.05 (O-CH_2), 62.79 (C-6), 54.52 (α), 41.47 (β), 31.20 (γ), 29.37 (δ), 24.55 (γ'), 23.71 (ω-1), 14.19 (ω) ppm.

HRMS(ESI): Calcd for $C_{17}H_{31}N_3O_6$ (M+H) 374.2291, found 374.2316; (M+Na) 396.2111 found 396.2134; Calcd for $^{12}C_{16}{}^{13}CH_{31}N_3O_6$ (M+H) 375.2325 (19 %), found 375.2346 (22 %); (M+Na) 397.2144 (19 %), found 397.2156 (20 %).

Elemental Anal. for $C_{17}H_{31}N_3O_6$ Calcd: C 54.68 %, H 8.37 %, N 11.25 %. Found: C 54.80 %, H 9.21 %, N 11.32 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-(2-butyl-octyl)-1,2,3-triazole (39)



Yield = 1.4 g (3.2 mmol, 89 %, 65 % overall, orange wax.

$[\alpha]_D^{25}$ = -26 (c = 0.41, MeOH).

IR [KBr]: 3380 (OH), 2956, 2929, 2860 (CH), 1641, 1459, 1377, 1227, 1157, 1077, 1048 cm^{-1}.

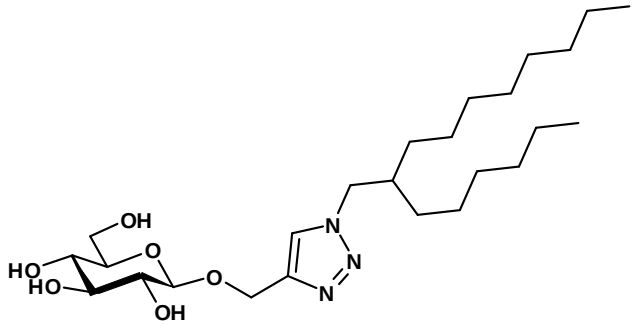
^1H NMR (400MHz, CD_3OD) δ = 7.98 (s, triazole), 4.95 (d, 1H, OCH_2-a, J=12.5 Hz), 4.77 (d, 1H, OCH_2-b, J=12.5 Hz), 4.36 (d, 1H, H-1, J=8.0 Hz), 4.29 (d, 2H, α-CH_2), 3.88 (dd, H-6a, J=12.0 Hz), 3.65 (dd, H-6b, J=12.0 Hz), 3.36-3.24 (m, 3H, H-3, H-4 & H-5), 3.20 (dd~t, H-2, J=9.0 Hz), 1.93 (m_c, 2H, β-CH), 1.40-1.18 (m, 16H, bulk-CH_2), 0.88, 0.87 (2t, 2x3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 146.14 (triazole-C), 126.26 (C=CH triazole), 103.91 (C-1), 78.27, 78.19 (C-3 & C-5), 75.21 (C-2), 71.81 (C-4), 63.11 (O-CH_2), 62.93 (C-6), 55.03 (α), 40.22 (β), 32.84, 32.29 (γ, γ'), 31.97, 31.54, 29.50, 27.21 (bulk-CH_2), 23.82, 23.57 (ω-1, ω'-1), 14.28, 14.19 (ω, ω') ppm.

HRMS(ESI): Calcd for $C_{21}H_{39}N_3O_6$ (M+H) 430.2917, found 430.2942; (M+Na) 452.2737 found 452.2758; Calcd for $^{12}C_{20}{}^{13}CH_{39}N_3O_6$ (M+H) 431.2951 (23 %), found 431.2972 (26 %); (M+Na) 453.2770 (23 %), found 453.2798 (24 %).

Elemental Anal. for $C_{21}H_{39}N_3O_6$ Calcd: C 58.72 %, H 9.15 %, N 9.78 %. Found: C 58.21 %, H 10.00 %, N 9.67 %.

4-(β-D-glucopyranosyl-oxymethyl)-1-(2-hexyl-decyl)-1,2,3-triazole (40)



Yield = 1.4 g (2.9 mmol, 86 %, 75 % overall, light yellow syrup.

$[\alpha]_D^{25}$ = -26 (c = 0.1, MeOH).

IR [KBr]: 3394 (OH), 2927, 2857 (CH), 1641, 1459, 1376, 1228, 1157, 1077, 1048 cm^{-1}.

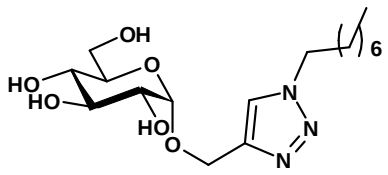
^{1}H NMR (400MHz, CD_3OD) δ = 7.99 (s, triazole), 4.96 (d, 1H, OCH_2-a, J=12.5 Hz), 4.77 (d, 1H, OCH_2-b, J=12.5 Hz), 4.36 (d, 1H, H-1, J=8.0 Hz), 4.29 (d, 2H, α-CH_2), 3.88 (dd~bd, H-6a, J=12.0 Hz), 3.67 (dd, H-6b, J=12.0 Hz), 3.38-3.24 (m, 3H, H-3, H-4 & H-5), 3.21 (dd, H-2, J=9.5 Hz), 1.94 (m_c, 2H, β-CH), 1.37-1.17 (m, 22H, bulk-CH_2), 0.88 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 145.49 (triazole-C), 125.78 (C=CH triazole), 103.53 (C-1), 77.98, 77.89 (C-3 & C-5), 74.93 (C-2), 71.56 (C-4), 62.99 (O-CH_2), 62.75 (C-6), 54.92 (α), 40.14 (β), 32.99, 32.83 (ω-2, ω'-2), 32.23 (2), 30.86, 30.56, 30.54 (bulk-CH_2), 27.23, 27.22 (γ, γ'), 23.69, 23.63 (ω-1, ω'-1), 14.47, 14.45 (ω, ω') ppm.

HRMS(ESI): Calcd for $C_{25}H_{47}N_3O_6$ (M+H486.3543, found 486.1410; (M+Na) 508.3363, found 508.1383; Calcd for $^{12}C_{24}{}^{13}CH_{47}N_3O_6$ (M+H) 487.3577 (28 %), found 487.1140 (30 %); (M+Na) 509.3396 (28 %), found 509.2958 (35 %).

Elemental Anal. for $C_{25}H_{47}N_3O_6$ Calcd: C 61.83 %, H 9.75 %, N 8.65 %. Found: C 61.41 %, H 10.87 %, N 8.54 %.

4-(α -D-glucopyranosyl-oxymethyl)-1-octyl-1,2,3-triazole (41)



Yield = 0.9 g (2.4 mmol, 83 %, 62 % overall, orange wax.

$[\alpha]_D^{25}$ = 89.0 (c = 0.28, MeOH).

IR [KBr]: 3386 (OH), 2928, 2858 (CH), 1639, 1445, 1226, 1148 cm^{-1}.

^{1}H NMR (400MHz, CD_3OD) δ = 8.03 (s, triazole), 4.91 (d, 1H, H-1, J=4.0 Hz), 4.83 (d, 1H, OCH_2-a, J=12.5 Hz), 4.67 (d, 1H, OCH_2-b, J=12.5 Hz), 4.40 (t, 2H, α-CH_2), 3.80 (dd, H-6a, J=12.0 Hz), 3.67 (dd, H-6b, J=12.0 Hz), 3.64 (dd~t, H-3, J=9.0 Hz), 3.59 (ddd, 1H, H-5, J=2.0 / 5.5 Hz), 3.40 (dd, H-2), 3.29 (dd~t, H-4, J=10.0 Hz), 1.90 (m_c, 2H, β-CH_2), 1.42-1.23 (m, 10H, , bulk-CH_2), 0.89 (t, 3H, CH_3) ppm.

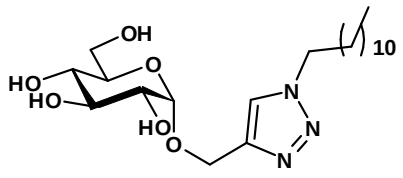
^{13}C NMR (100 MHz, CD_3OD) δ = 145.97 (triazole-C), 125.61 (C=CH triazole), 99.87, (C-1), 77.19 (C-3), 74.14 (C-5), 73.63 (C-2), 71.92 (C-4), 62.80 (C-6), 61.51 (O-CH_2),

51.42 (α), 32.82 (ω-2), 31.21, 30.13, 29.97 (bulk-CH_2), 27.39 (β), 23.54 (ω-1), 14.29 (ω) ppm.

HRMS(ESI): Calcd for $C_{17}H_{31}N_3O_6$ (M+H) 374.2291, found 374.2321; (M+Na) 396.2111 found 396.2136; Calcd for $^{12}C_{16}{}^{13}CH_{31}N_3O_6$ (M+H) 375.2325 (19 %), found 375.2348 (21 %); (M+Na) 397.2144 (19 %), found 397.2161 (20 %).

Elemental Anal. for $C_{17}H_{31}N_3O_6$ Calcd: C 54.68 %, H 8.37 %, N 11.25 %. Found: C 54.82 %, H 8.95 %, N 11.22 %.

4-(α-D-glucopyranosyl-oxymethyl)-1-dodecyl-1,2,3-triazole (42)



Yield = 1.0 g (2.3 mmol, 80 %, 60 % overall, light orange solid.

$[\alpha]_D^{25}$ = 79.4 (c = 0.47, MeOH).

IR [KBr]: 3386 (OH), 2924, 2852 (CH), 1648, 1451, 1365, 1224, 1151, 1107, 1076, 1040 cm^{-1}.

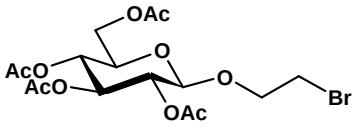
^{1}H NMR (400MHz, CD_3OD) δ = 8.00 (s, triazole), 4.87 (d, 1H, H-1, J=4.0 Hz), 4.78 (d, 1H, OCH_2-a, J=12.5 Hz), 4.62 (d, 1H, OCH_2-b, J=12.5 Hz), 4.35 (t, 2H, α-CH_2), 3.76 (dd, H-6a, J=12.0 Hz), 3.63 (dd, H-6b, J=12.0 Hz), 3.60 (dd~t, H-3, J=9.0 Hz), 3.55 (ddd, 1H, H-5, J=2.0 / 5.0 Hz), 3.37 (dd, H-2, J=10.0 Hz), 3.26 (dd~t, H-4, J=10.0 Hz), 1.85 (m_c, 2H, β-CH_2), 1.35-1.21 (m, 18H, , bulk-CH_2), 0.84 (t, 3H, CH_3) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 145.90 (triazole-C), 125.57 (C=CH triazole), 99.81, (C-1), 75.14 (C-3), 74.09 (C-5), 73.58 (C-2), 71.88 (C-4), 62.76 (C-6), 61.47 (O-CH_2), 51.38 (α), 32.96 (ω-2), 31.19, 30.63 (2), 30.56, 30.45, 30.35, 30.01 (bulk-CH_2), 27.39 (β), 23.58 (ω-1), 14.31 (ω) ppm.

HRMS(ESI): Calcd for $C_{21}H_{39}N_3O_6$ (M+H) 430.2917, found 430.2951; (M+Na) 452.2737 found 452.2767; Calcd for $^{12}C_{21}{}^{13}CH_{39}N_3O_6$ (M+H) 431.2951 (23 %), found 431.2982 (26 %); (M+Na) 453.2770 (23 %), found 453.2806 (24 %).

Elemental Anal. for $C_{21}H_{39}N_3O_6$ Calcd: C 58.72 %, H 9.15 %, N 9.78 %. Found: C 58.68 %, H 10.63 %, N 9.87 %.

2-bromoethyl-2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranoside (Dahmén, 1983b) **(48)**

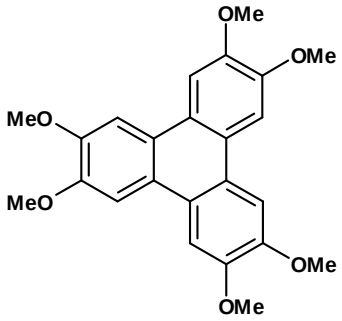


Yield = 6.8 g (15.0 mmol, 60 %), white solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 5.21 (dd~t, 1H, H-3, J=9.5 Hz), 5.07 (dd~t, 1H, H-4, J=9.5 Hz), 4.95 (dd, 1H, H-2, J=9.5 Hz), 4.56 (d, 1H, H-1, J=8.0 Hz), 4.24 (dd, 1H, H-6a, J=12.0 Hz), 4.18-4.10 (m, 2H, H-6b & O-$CH_{2\alpha}$), 3.84-3.76 (m, 1H, O-$CH_{2\beta}$), 3.69 (ddd, 1H, H-5, J=5.0 Hz), 3.48-3.41 (m, 2H, CH_2-Br), 2.07, 2.06, 2.01, 1.99 (4s, 4x3H, Ac) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =170.61, 170.23, 169.39, 169.37 (CO), 101.00 (C-1), 72.59 (C-3), 71.92 (C-5), 71.01 (C-2), 69.76(C-4), 68.31 (OCH_2), 61.82 (C-6), 29.82 (CH_2Br), 20.72, 20.58, 20.57, 20.56 (Ac).

2,3,6,7,10,11-hexamethoxytriphenylene (Stackhouse & Hird, 2008; Zniber, 2002)**(49)**

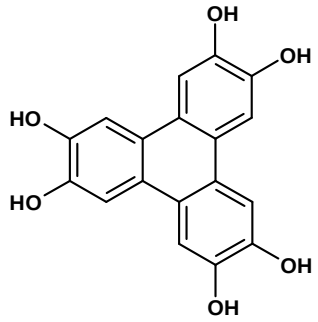


Yield = 21 g (51.4 mmol, 87 %), light gray solid.

^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.80 (s, 6H, 1-H, 4-H, 5-H, 8-H, 9-H, 12-H), 4.12 (s, 18H, OCH_3) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ = 149.23 (C-2, C-3, C-6, C-7, C-10, C-11), 123.50 (C-1a, C-4a, C-5a, C-8a, C-9a, C-12a), 104.54 (C-1, C-4, C-5, C-8, C-9, C-12), 55.99 (OCH_3) ppm.

2,3,6,7,10,11-hexahydroxytriphenylene (Frederik C. Krebs, 1997) **(50)**

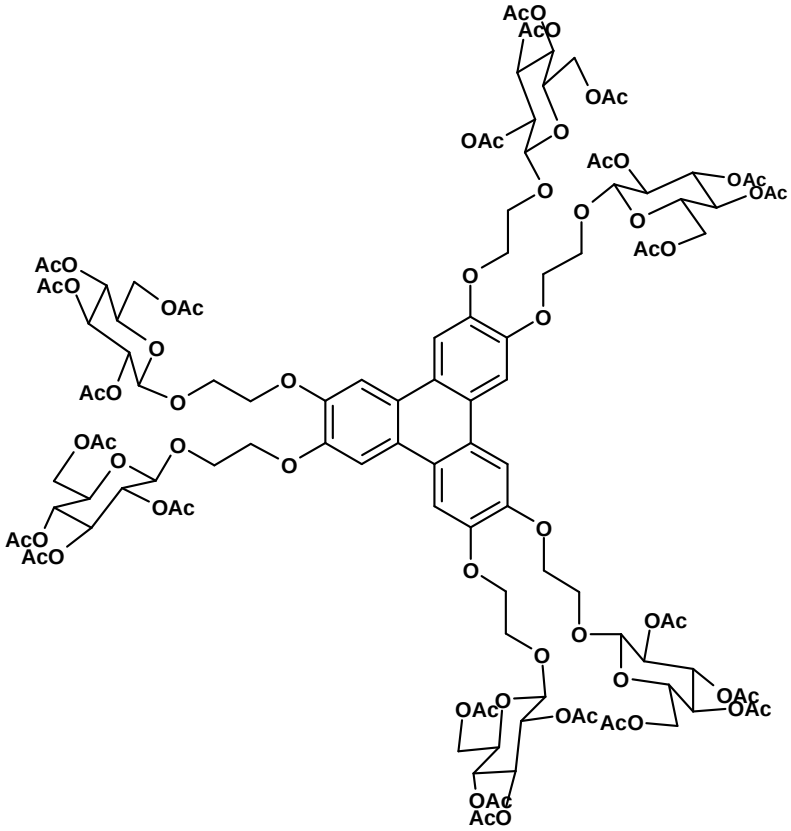


Yield = 2.5 g (7.8 mmol, 86 %), gray solid.

^{1}H NMR (400 MHz, CD_3OD) δ = 7.72 (s, 6H, 1-H, 4-H, 5-H, 8-H, 9-H, 12-H) ppm.

^{13}C NMR (100 MHz, CD_3OD) δ = 146.23 (C-2, C-3, C-6, C-7, C-10, C-11), 124.26 (C-1a, C-4a, C-5a, C-8a, C-9a, C-12a), 108.84 (C-1, C-4, C-5, C-8, C-9, C-12) ppm.

2,3,6,7,10,11-hexakis-(2-[2,3,4,6-tetra-*O*-acetyl-β-D-glucopyranosyle-oxy]-ethoxy)-triphenylene (52)

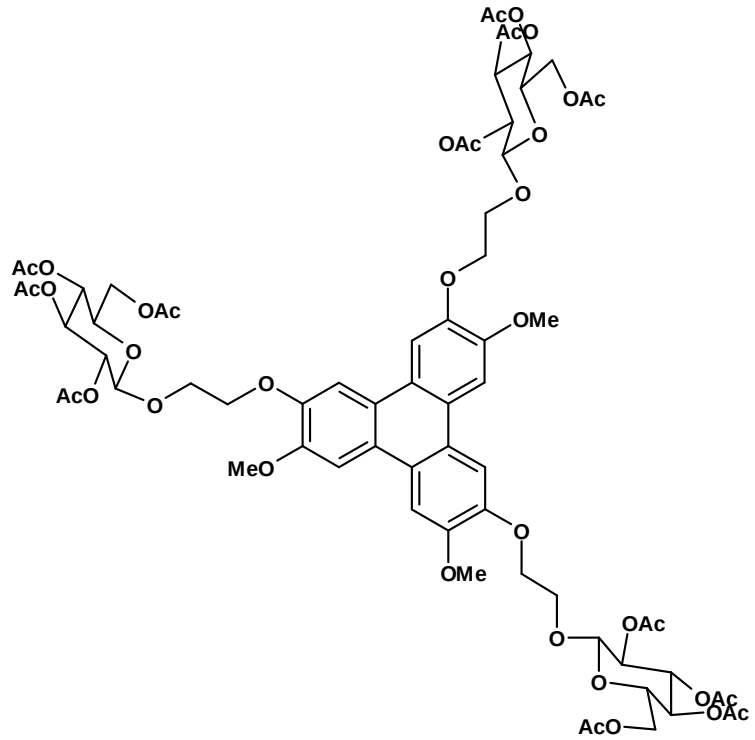


Yield = 1.7 g (0.6 mmol, 83 %), light brown solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.83 (s, 6H, triphenylene-H), 5.26 (dd~t, 6H, H-3, J=9.5 Hz), 5.12 (dd~t, 6H, H-4, J=9.5 Hz), 5.06 (dd, 6H, H-2, J=9.0 Hz), 4.82 (d, 6H, H-1, J=8.0 Hz), 4.38 (m_c, 12H, OCH_2-β), 4.33-4.22 (m, 12H, H-6a & OCH_2-α), 4.19-4.06 (m, 12H, H-6b & OCH_2-α'), 3.83 (ddd, 6H, H-5), 2.15, 2.03, 2.03, 1.89 (4s, 6x4x3H, Ac) ppm.

^{13}C NMR (100 MHz, $CDCl_3$) δ =170.65, 170.24, 169.40, 169.39 (CO), 148.56 (TP-CO), 123.92 (TP-C), 108.05(TP-CH), 101.24 (C-1), 72.75 (C-3), 71.85 (C-5), 71.24 (C-2), 68.90(C-4), 68.42 (2x OCH_2), 61.85 (C-6), 20.69, 20.58, 20.57, 20.52 (Ac) ppm.

2,6,11-tris-(2-[2,3,4,6-tetra-*O*-octyl-β-D-glycopyranosyl-oxy]-ethoxy)-3,7,10-tri-methoxy-triphenylene (53)

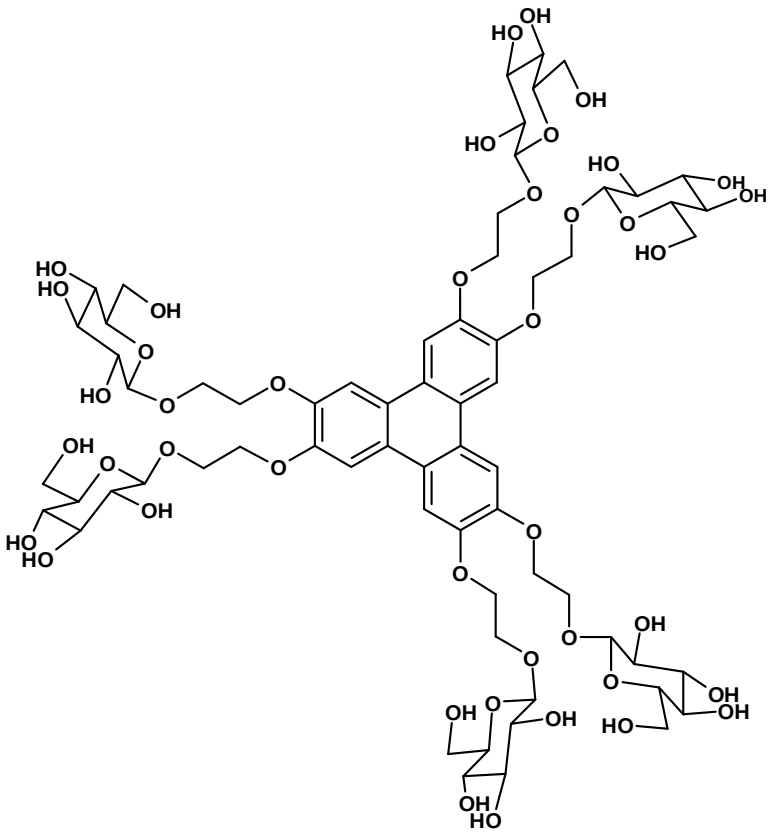


Yield = 1.8 g (1.2 mmol, 61 %), light brown solid.

^{1}H NMR (400MHz, $CDCl_3$) δ = 7.76, 7.84, 7.82 (3 x s, 6H, triphenylene-H), 5.24 (dd~t, 3H, H-3, J=9.5), 5.09 (dd~t, 3H, H-4, J=10), 5.03 (m_c, 3H, H-2), 4.80-4.90 (m, 3H, H-1), 4.40 (m_c, 6H, H-6), 4.26 (m_c, 6H, OCH_2-β), 4.14 (m_c, 6H, OCH_2-α), 4.10 (m_c, 3H, OCH_3), 3.73 (ddd, 3H), 1.83-2.10 (4 s, 3x4x3H, Ac).

^{13}C NMR (100 MHz, $CDCl_3$) δ =170.65, 170.63, 170.25, 170.23, 169.49, 169.47, 169.39(2) (CO), 149.46(2), 149.31, 148.13, 148.07, 147.95 (TP-CO), 124.09, 123.95, 123.78, 123.36, 123.17, 123.12 (TP-C), 107.51, 107.01, 104.99(3) (TP-CH), 101.22, 101.17 (C-1), 72.82, 72.76(2) (C-3), 71.90(3) (C-5), 71.19(3) (C-2), 69.12, 69.08 (C-4), 68.41(3), 68.21, 68.15 (OCH_2), 61.85(2) (C-6), 56.18, 56.16, 56.12 (OCH_3), 20.79, 20.54(3), 20.55(3), 20.40, 20.37 (Ac) ppm.

2,3,6,7,10,11-Hexakis-(2-[β-D-glucopyranosyle-oxy]-ethoxy)-triphenylene (54)



Yield = 0.8 g (0.5 mmol, 80 %), brown solid.

Cr 62 °C Col_h 190 °C (4.9 kJ mol^{-1}) Iso, dec 308 °C.

$[\alpha]_D^{25}$ = -14.3 (c= 1.95, H_2O).

UV/VIS (H_2O): 1.18E-05 mol/L, λ_{max} (lg ε_{max}) = 275 (5.06), 267 (4.99) nm.

IR [KBr]: 3391 (OH), 2938, 2883 (CH), 1633, 1515, 1437, 1263, 1162, 1075, 1029, 887, 846, 796 cm^{-1}.

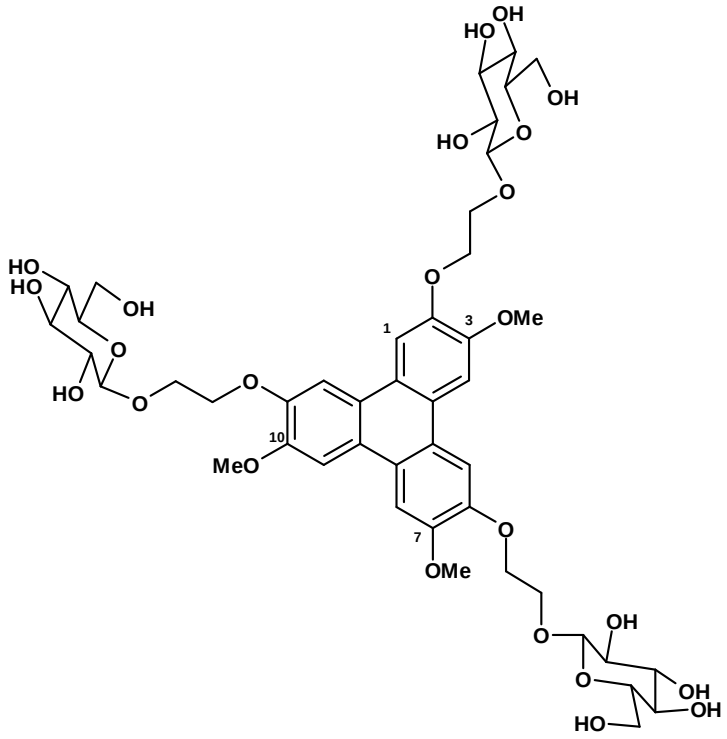
Fluorescence (H_2O, excitation 267 nm and 275 nm): $\lambda_{em\ max}$ = 382 nm,

Fluorescence (H_2O, emission 382 nm): $\lambda_{ex\ max}$ = 275 nm.

^{1}H NMR (400MHz, DMSO-d_6) δ = 8.05 (br. s, 6H), 5.42-4.61 (br. s, ~24H), 4.53-4.41 (m, 12H, OCH_2-β), 4.33 (d, 6H, H-1, J=8.0), 4.20, 3.96 (m_c, 2x 6H, OCH_2-α), 3.68 (d, 6H, H-6a, J=10.0), 3.48 (dd, 6H, H-6b, J=5.5), 3.23-3.11 (m, 12H, H-3 & H-5), 3.10-3.00 (m, 12H, H-4 & H-2).

^{13}C NMR (100 MHz, DMSO-d_6) δ = 148.13 (TP-CO), 123.02 (TP-C), 107.23 (TP-CH), 103.15 (C-1), 76.85 (C-3), 76.69 (C-5), 73.41 (C-2), 70.05(C-4), 68.56, 67.25 (2xOCH_2), 61.03 (C-6) ppm.

3,7,10-tri-methoxy-2,6,11-tris-(2-[β-D-glucopyranosyle-oxy]-ethoxy)-triphenylene (55)



Yield = 0.5 g (0.5 mmol, 78 %), brown solid.

Cr_1 82 °C Col_2 213 °C (27.9 kJ mol^{-1}) Iso, dec 348 °C.

$[\alpha]_D^{25}$ = -7.0 (c= 1.86, H_2O).

UV/VIS (H_2O): 5.48E-06 mol/L, λ_{max} (lg ε_{max}) = 275 (4.85), 267 (4.86) nm.

IR [KBr]: 3400 (OH), 2938, 2878 (CH), 1633, 1528, 1436, 1267, 1167, 1081, 1048, 892, 842, 791 cm^{-1}.

Fluorescence (H_2O, excitation 267 nm and 275 nm): $\lambda_{em\ max}$ = 382 nm.

Fluorescence (H_2O, emission 382 nm): $\lambda_{ex\ max}$ = 275 nm.

^{1}H NMR (400MHz, DMSO-d_6) δ = 8.03, 8.01, 8.00 (3 x s, 6H, triphenylene-H), 5.12-4.58 (br. m, ~12H), 4.45 (m_c, 6H, OCH_2-β), 4.34 (d, 3H, H-1, J=8.0), 4.23 (m_c, 3H,

OCH_2-α), 4.05 (br. s, 9H, OCH_3), 3.94 (m_c, 3H, OCH_2-α'), 3.75-3.65 (m, 3H, H-6a), 3.52-3.41 (m, 3H, H-6b), 3.22-3.12 (m, 6H, H-4 & H-3), 3.14-2.99 (m, 6H, H-5 & H-2). ^{13}C NMR (100 MHz, DMSO-d_6) δ = 148.83, 148.81, 148.76, 147.91, 147.87, 147.85 (TP-CO), 122.78, 122.77, 122.76, 122.75, 122.67(2) (TP-C), 106.40, 106.23, 105.25(2) (TP-CH), 103.12(6) (C-1), 76.94(6) (C-3), 76.74(6) (C-5), 73.41(6) (C-2), 70.05(6) (C-4), 68.26, 67.23 (3xOCH_2), 61.07(5) (C-6), 55.83(3) (OCH_3).

Appendix (3) List of scientific contribution

Publication (published)

1- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim, Farhanullah. (2012). **Alkyl triazole glycosides (ATGs)-a new class of bio-related surfactants**, Colloids and Surfaces B: Biointerfaces, 97, 196-200.
(Impact Factor: 3.456)

Patent application

1- Thorsten Heidelberg, Faramarz Aliasghari Sani, Rauzah Hashim, **A non-ionic surfactant comprising a triazole-linked glycoside and method for producing thereof.**
Application. No: PI 2010002268.

Publication (submitted)

1- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim**, Synthesis of novel sugar based non-ionic chromonics**, Journal of Iranian Chemical Society.

International conferences

1- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim, **Sugar based Non-Ionic Chromonics.** NanoFormulation 2012, 28 May - 1 June 2012, Barcelona, Spain. **(Oral presentaion)**

2- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim**, Novel non-ionic sugar based surfactants**. 11th Eurasia Conference on Chemical Sciences 6-10 Oct, 2010, the Dead Sea, Jordan. **(Oral presentaion)**

2- Faramarz Aliasghari Sani, Thorsten Heidelberg, Farhanullah, Rauzah Hashim, **Alkyl triazole glycosides: novel non-ionic surfactants for soft-nanomaterial application.** Nanoformulation 2011, 26 June to 1 July 2011, Stockholm, Sweden. **(Poster presentaion)**

3- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim, **Novel type of sugar based surfactants.** Inform Connect 2010, Rimba Ilmu Lecture Theater, Kuala Lumpur, 13th of January 2010. **(Poster presentaion)**

Local conferences

1- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim, **Novel approach towards sugar based surfactants.** Liquid Crystal and self assembly Workshop 2009 (LCSA 2009), 10 Oct. 2009, Kuala Lumpur (KLCC). **(Poster presentaion)**

2- Faramarz Aliasghari Sani, Thorsten Heidelberg, Rauzah Hashim, **Novel type of sugar based surfactants.** University of Malaya-Hyderabad University Bilateral Seminar, 26-28 Oct. 2010, Dep. Chemistry. **(Poster presentaion)**

Awards

1- Faramarz Aliasghari Sani. **Travel grant to participate NanoFormulation 2012 conference, Spain (Barcelona),** Awarding Institution: Integrating Nanomaterials in Formulations (Inform), European Union FP7.
Award: Certificate and Money

2- Thorsten Heidelberg, Faramarz Aliasghari Sani, Rauzah Hashim. **Alkyl triazole glycosides (ATGS) novel non-ionic surfactants from bio-resources.** (21st Internationa Invention, Innovation & Technology Exhibition ITEX2010, Kuala Lumpur,14th-6th May 2010).
Award: Bronze medal and Certificate