Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information for

"Control of Free Volume and Size Exclusion in the Formation of Smectic C Phases for Display Applications"

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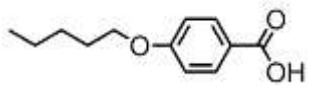
1 Synthesis:

1.2 General Methods.

All chemicals were purchased from Sigma-Aldrich or Apollo Scientific and used as received, without further purification. Solvents were dried by percolation through a column of activated alumina prior to use. NMR spectra were recorded on a JEOL ECX spectrometer operating at 400 MHz (^{1}H), 100.5 MHz (^{13}C), 376.4 MHz (^{19}F). Silicon NMR spectra were recorded on a JEOL ECS spectrometer operating at 76.4 MHz. One dimensional ^{1}H NOE NMR experiments were performed on a Bruker Avance 500 spectrometer operating at 500 MHz and 400 MHz (pulse program selnogp [SI1-SI3]) at 298 K in $CDCl_3$. Mass spectra were recorded on a Bruker micrOTOF MS-Agilent series 1200LC spectrometer. FTIR spectroscopy was performed using a Shimadzu IR Prestige-21 with Specac Golden Gate diamond ATR IR insert. High-performance liquid chromatography was performed on a Shimadzu Prominence modular HPLC system comprising a LC-20A liquid chromatograph, a DGU-20A_5 degasser, a SIL-20A autosampler, a CBM-20A communication bus, a CTO-20A column oven, and a SPO-20A dual wavelength UV-vis detector. The column used was an Alltech C18 bonded reverse-phase silica column with a 5 μm pore size, an internal diameter of 10 mm and a length of 250 mm. Polarised optical microscopy was performed on a Zeiss Axioskop 40Pol microscope using a Mettler FP82HT hotstage controlled by a Mettler FP90 central processor. Photomicrographs were captured *via* an InfinityX-21 MP digital camera mounted atop the microscope. Differential scanning calorimetry was performed on a Mettler DSC822^{e} fitted with an autosampler operating with Mettler Star^{e} software and calibrated before use against an indium standard (onset = 156.55 ± 0.2 °C, ΔH = 28.45 ± 0.40 Jg^{-1}) under an atmosphere of dry nitrogen. Small angle X-ray diffraction was performed using a Bruker D8 Discover equipped with a temperature controlled, bored graphite rod furnace, custom built at the University of York. Samples were filled into 1mm capillary tubes and aligned magnetically with a 1T magnet. Diffraction patterns were collected as a function of temperature and the data processed using Bruker DIFFRAC.SUITE EVA software. Computational studies were performed using Gaussian 09. [SI4]

Experimental



4-Pentyloxybenzoic acid (13)

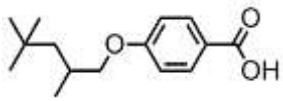
1-Bromopentane (25 g, 20.5 ml, 165.5 mmol) was added dropwise to a stirred, heated suspension of potassium carbonate (45 g, 330 mmol) and methyl 4-hydroxybenzoate (22.8 g, 150 mmol) in acetone (200 ml) under reflux. The solution was stirred for 16h, filtered and the solvent removed *in vacuo*. The crude residue was dissolved into diethyl ether (300 ml), which was washed with sodium hydroxide solution (2M, 200 ml). The organic layer was dried over $MgSO_4$ and dried *in vacuo* to yield crude methyl 4-pentyloxybenzoate. The crude methyl 4-pentyloxybenzoate was dissolved into ethanol (120 ml), solid KOH (50 g) and water (10 ml) were added and the resulting solution was heated under reflux for 1 h, then cooled to r.t. and diluted with water (250 ml) and filtered. The filtrate was acidified to pH 1 with 36% HCl, causing the title compound to precipitate as a white solid. The solid was collected by filtration and dried under reduced pressure affording the title compound as a powdery white solid.

Yield: 25.4 g (81%)

MP: 127 °C

^{1}H NMR (400 MHZ, DMSO-D6): 0.82 (3H, t, *J* = 7.0, $\underline{CH_3}$-CH_2), 1.22 – 1.37 (4H, m, CH_3-($\underline{CH_2}$)$_2$-CH_2), 1.65 (2H, Quintet, *J* = 7.0, CH_2-$\underline{CH_2}$-CH_2OAr), 3.95 (2H, t, *J* = 7.0, CH_2-$\underline{CH_2}$OAr), 6.90 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar), 7.80 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar)

MS m/z (ESI+):231.0988 (100%, $C_{12}H_{16}NaO_3$, M+Na), 209.1170 ($C_{12}H_{17}O_3$, M+H)



4-(2,4,4-Trimethylpentyloxy)benzoic acid (14)

To a stirred solution of 2,4,4-trimethylpentan-1-ol (5 g, 38.46 mmol), triphenyl phosphine (10.1 g, 38.46 mmol) and methyl 4-hydroxybenzoate (5.9 g, 38.46 mmol) in anhydrous THF (50 ml), under an atmosphere of dry nitrogen, was added neat DIAD (7.8 g, 7.5 ml, 38.46 mmol) dropwise over a period of 0.5h. The resulting solution was stirred for 16h, and the solvent removed *in vacuo*. Ethanol (100 ml) was added to the crude residue and the solution was heated under reflux before the addition of 4M sodium hydroxide solution (50 ml). The solution was heated under reflux for 16 h, cooled to r.t. and diluted with water (100 ml) and filtered. The filtrate was acidified to pH 1 with 36% HCl, the resulting precipitate collected by filtration and recrystallised from ethanol giving the title compound as translucent needles.

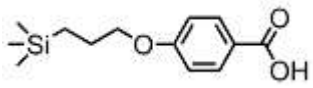
Yield: 9.0 g (88.6%)

MP: 106.3 °C

^{1}H NMR (400 MHZ, Acetone-D6): 0.79 (9H, s, C-($\underline{CH_3}$)$_3$), 0.88 (3H, d, *J* = 6.4, $\underline{CH_3}$-CH), 1.13 (1H, dd, *J* = 6.1, *J* = 14.0, $(CH_3)_3$C-C$\underline{H}$H-CH(CH_3)-CH_2), 1.47 (1H, dd, *J* = 3.7, *J* = 14.0, $(CH_3)_3$C-CH$\underline{H}$-CH(CH_3)-CH_2), 1.97 – 2.07 (1H, M, $(CH_3)_3$C-CH_2-C$\underline{H}$(CH_3)-CH_2), 3.81 (1H, dd, *J* = 7.0, *J* = 9.2, CH_3CH-C$\underline{H}$H-OAr), 3.90 (1H, dd, *J* = 6.1, *J* = 9.2, CH_3CH-C$\underline{H}$H-OAr), 6.90 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar), 7.80 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar).

MS M/Z (ESI+): 273.1462 (100%, $C_{15}H_{22}NaO_3$, M+Na), 251.1650 ($C_{15}H_{23}O_3$, M+H)

IR: 547, 640, 771, 840, 941, 1026, 1118, 1157, 1249, 1296, 1427, 1604, 1674, 2553, 2669, 2826, 2947



4-(3-(Trimethylsilyl)propoxy)benzoic acid (15)

Quantities used: Methyl 4-hydroxybenzoate (5.5 g, 36.36 mmol), triphenylphosphine (7.9 g, 30.303 mmol), DIAD (6.1 g, 5.9 ml, 30.303 mmol), 3-(trimethylsilyl)propan-1-ol (4 g, 30.303 mmol), anhydrous THF (20 ml), then aqueous 4M sodium hydroxide (50 ml), ethanol (50 ml). The experimental procedure was as described in the synthesis of compound **13**, giving the title compound as a white powder.

Yield: 7.1 g (93 %)

MP: 172 °C

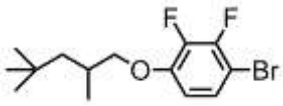
^{1}H NMR (400 MHZ, DMSO-D6): 0.00 (3H, s, Si-($\underline{CH_3}$)$_3$), 0.58 (2H, m, $(CH_3)_3$-Si-$\underline{CH_2}$), 1.66 – 1.76 (2H, m, $(CH_3)_3$Si-CH_2-$\underline{CH_2}$-CH_2O), 3.98 (2H, t, *J* = 6.7, CH_2OAr), 6.98 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar), 7.86 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar), 12.60 (1H, BrS, Ar$\underline{COOH}$)

^{13}C NMR (100.5 MHz, Acetone-D6): -2.49, 12.21, 23.60, 70.64, 114.16, 122.60, 131.69, 163.11, 166.61

^{29}Si NMR (79.42 MHz, Acetone-D6): 0.01 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 275.1086 (100%, $C_{13}H_{20}SiNaO_3$, M+Na), 253.1258 ($C_{13}H_{21}SiO_3$, M+H)

IR: 547, 640, 694, 771, 833, 894, 956, 995, 1165, 1242, 1288, 1427, 1604, 1666, 2538, 2654, 2800, 2870, 2939



1-Bromo-2,3-difluoro-4-((2,4,4-trimethylpentyl)oxy)benzene (4)

4-Bromo-2,3-difluorophenol (8 g, 38.462 mmol), triphenylphosphine (10 g, 38.462 mmol) and 2,4,4-trimethylpentanol (5 g, 36.462 mmol) were dissolved into anhydrous THF (100 ml) before the dropwise addition of DIAD (7.8 g, 7.6 ml, 38.462 mmol). The reaction was followed *via* TLC and upon complete consumption of the starting materials (1 h) the solvents were removed i*n vacuo*. The title compound was isolated as a straw coloured oil *via* flash chromatography with DCM as the eluent (*Rf* = 0.95).

Yield: 11.4 g (93%)

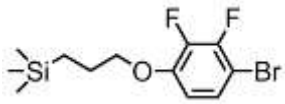
^{1}H NMR (400 MHZ, $CDCl_3$): 0.91 (9H, s, C-($\underline{CH_3}_3$), 1.05 (3H, d, *J* = 6.4, $\underline{CH_3}$-CH), 1.13 (1H, dd, *J* = 6.1, *J* = 14.0, $(CH_3)_3$C-C$\underline{H}$H-CH(CH_3)-CH_2), 1.36 (1H, dd, *J* = 4.0, *J* = 14.0, $(CH_3)_3$C-CH$\underline{H}$-CH(CH_3)-CH_2), 1.96 – 2.05 (1H, M, $(CH_3)_3$C-CH_2-C$\underline{H}$(CH_3)-CH_2), 3.67 (1H, dd, *J* = 7.3, *J* = 8.5, CH_3CH-C$\underline{H}$H-OAr), 3.80 (1H, dd, *J* = 6.4, *J* = 8.5, CH_3CH-C$\underline{H}$H-OAr), 6.61 (2H, ddd, *J* = 2.1, *J* = 7.6, *J* = 9.2, Ar), 7.14 (2H, ddd, *J* = 2.1, *J* = 7.6, *J* = 9.2, Ar)

^{13}C NMR (100.5 MHZ, $CDCl_3$): 19.86, 29.67, 29.87, 31.01, 47.24, 76.02, 110.31 (d, *J* = 3.1), 126.30 (d, *J* = 4.6), 130.43 (d, *J* = 12.3, *J* = 362.87), 142.16 (dd, *J* = 14.6, *J* = 251.6), 148.42 (dd, *J* = 3.1, *J* = 8.4), 148.83 (dd, *J* = 14.6, *J* = 247.0)

^{19}F NMR (376.4 MHz, $CDCl_3$): -152.72 (ddd, *J* = 2.3, *J* = 8.0, *J* = 20.7, Ar-F), -129.21 (ddd, *J* = 2.3, *J* = 8.0, *J* = 20.7, Ar-F)

MS M/Z (ESI+): 321.0672 (100%, $C_{14}H_{19}F_2OBr$, M + H)

IR: 594, 732, 786, 879, 972, 1080, 1219, 1303, 1365, 1465, 1612, 2870, 2954



(3-(4-Bromo-2,3-difluorophenoxy)propyl)trimethylsilane (5)

Quantities used: 4-Bromo-2,3-difluorophenol (2.4 g, 11.364 mmol), triphenylphosphine (2.9 g, 11.364 mmol), DIAD (2.3 g, 2.3 ml, 11.364 mmol), trimethylsilyl)propan-1-ol (1.5 g, 11.364 mmol), THF (60 ml). The experimental procedure was as described in the synthesis of compound **4**. The title compound was isolated as a straw coloured oil *via* flash chromatography with DCM as the eluent (*Rf* = 0.95).

Yield: 2.9 g (79 %)

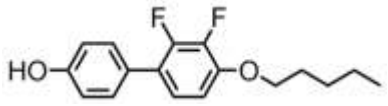
^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, $(\underline{CH_3})_3Si$), 0.53 – 0.60 (2H, m, CH_2-$\underline{CH_2}$-Si$(CH_3)_3$), 1.71 – 1.84 (2H, m, OCH_2-$\underline{CH_2}$-CH_2), 3.94 (2H, t, *J* = 7.0, $\underline{CH_2}O$), 6.56 – 6.66 (1H, m, Ar), 7.16 (1H, m, Ar)

^{13}C NMR (100.5 MHZ, $CDCl_3$): -1.82, 12.30, 23.67, 72.54, 100.34 (d, *J* = 18.4), 110.24, 126.26 (d, *J* = 4.6), 142.00 (dd, *J* = 16.0, *J* = 250.1), 148.12 (dd, *J* = 2.3, *J* = 8.2), 148.70 (dd, *J* = 12.3, *J* = 247.0),

^{19}F NMR (376.4 MHZ, $CDCl_3$): -154.77 (1F, dd, *J* = 6.9, *J* = 19.5, Ar-F), -129.1 (1F, d, *J* = 19.5, Ar-F)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.47 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 325.0266 (100%, $C_{12}H_{17}F_2OBrSi$, M + H)



2',3'-Difluoro-4'-(pentyloxy)-[1,1'-biphenyl]-4-ol (8)

A suspension of (2',3'-difluoro-4'-(pentyloxy)-[1,1'-biphenyl]-4-yl)boronic acid (4 g, 12.5 mmol) in diethyl ether (100 ml) was heated under reflux with stirring for 30 minutes, before the addition of 30% hydrogen peroxide (50 ml) in one portion. The suspension rapidly dissolved, giving a golden yellow coloured solution, and the reaction was monitored by TLC until no further consumption of the boronic acid was noted (30 minutes). The biphasic reaction mixture was cooled to ambient temperature before separating and discarding the aqueous layer. The ethereal solution was washed with water (3 x 100 ml), dried over $MgSO_4$ and the solvent removed *in vacuo* to give a yellow solid. This was subjected to flash chromatography with DCM as the eluent affording the product (*Rf* = 0.35) as a white solid.

Yield: 3.4 g (93 %)

MP: 119.5 °C

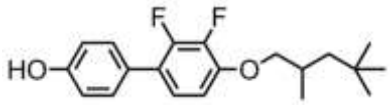
^{1}H NMR (400 MHZ, $CDCl_3$): 0.91 (3H, t, *J* = 7.0, $\underline{CH_3}$-CH_2), 1.31 – 1.51 (4H, m, CH_3-($\underline{CH_2}$)$_2$-CH_2), 1.81 (2H, Quintet, *J* = 7.0, OCH_2-$\underline{CH_2}$-CH_2), 4.04 (2H, t, *J* = 7.0, CH_2O), 4.91 (1H, s, Ar-OH), 6.74 (1H, ddd, *J* = 1.8, *J* = 7.7, *J* = 8.8, Ar-H), 6.87 (2H, ddd, *J* = 2.2, *J* = 2.9, *J* = 8.8, Ar), 7.01 (1H, td, *J* = 2.2, *J* = 8.8, Ar), 7.31 (2H, dddd, *J* = 1.5, *J* = 2.9, *J* = 3.7, *J* = 8.8, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): 13.97, 22.38, 27.99, 28.83, 69.89, 109.53 (d, *J* = 2.3), 115.43, 122.59 (d, *J* = 10.7), 123.22 (t, *J* = 4.6), 127.55, 130.06 (d, *J* = 3.1), 141.72 (dd, *J* = 15.3, *J* = 247.0), 147.38 (dd, *J* = 3.1, *J* = 8.4), 148.76 (dd, *J* = 10.7, *J* = 247.8), 155.06

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.76 (1F, ddd, *J* = 2.3, *J* = 6.9, *J* = 19.5, Ar-$\underline{F}$), -142.01 (1F, dd, *J* = 6.9, *J* = 19.5, Ar-$\underline{F}$)

MS M/Z (ESI+): 315.1157 (100%, $C_{17}H_{18}F_2NaO_2$, M+Na)

IR: 501, 617, 732, 810, 894, 972, 1072, 1195, 1249, 1288, 1365, 1612, 2862, 2931, 3433



2',3'-Difluoro-4'-((2,4,4-trimethylpentyl)oxy)-[1,1'-biphenyl]-4-ol (9)

To a stirred, thoroughly degassed suspension of compound **4** (5 g, 15.625 mmol) in THF (100 ml) and aqueous 2M sodium carbonate (100 ml) heated under reflux was added $Pd(PPh_3)_4$ (100 mg) in one portion. The resulting solution was stirred for 30 minutes before the addition of 4-hydroxybenzeneboronic acid (2.4 g, 17.188 mmol) in one portion. The reaction solution was then stirred for a further 14h. The biphasic solution was cooled to ambient temperature and diethyl ether added. The aqueous layer was separated from the organic, acidified with 6M HCl and washed with diethyl ether (3 x 50 ml) before discarding. The combined ethereal extracts were dried over Na_2SO_4, and concentrated *in vacuo* to a dark brown oil The target compound was obtained *via* flash chromatography over silica gel with DCM as the eluent (*Rf* = 0.35), affording a viscous straw coloured oil. The crude oil was triturated with hot petroleum ether and allowed to cool to ambient temperature, at which point the title compound precipitated out as a white solid and was collected by filtration.

Yield: 4.2 g (80%)

MP: 63.2 °C

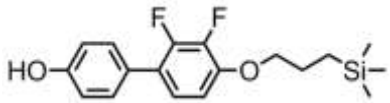
^{1}H NMR (400 MHZ, $CDCl_3$): 0.94 (9H, s, C-($\underline{CH_3}$)$_3$), 1.09 (3H, d, *J* = 6.1, $\underline{CH_3}$-CH), 1.10 – 1.15 (1H, m, $(CH_3)_3$C-C$\underline{H}$H-CH(CH_3)-CH_2) 1.36 – 1.42 (1H, m, $(CH_3)_3$C-CH$\underline{H}$-CH(CH_3)-CH_2), 1.99 – 2.10 (1H, M, $(CH_3)_3$C-CH_2-C$\underline{H}$(CH_3)-CH_2), 3.73 (1H, td, *J* = 7.3, *J* = 8.9, CH_3CH-C$\underline{H}$H-OAr), 3.87 (1H, dd, *J* = 5.8, *J* = 8.9, CH_3CH-C$\underline{H}$H-OAr), 6.75 (1H, m, dd, *J* = 2.1, *J* = 8.5, Ar), 6.89 (2H, ddd, *J* = 2.1, *J* = 3.1, *J* = 8.9, Ar), 7.03 (1H, td, *J* = 2.1, *J* = 8.5, Ar), 7.38 (2H, dddd, *J* = 1.5, *J* = 2.8, *J* = 3.7, *J* = 8.5, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): 19.97, 29.73, 29.93, 31.07, 47.31, 75.98, 109.63 (d, *J* = 3.1), 115.56, 122.66 (d, *J* = 10.7), 123.32 (t, *J* = 3.8), 127.63, 130.17 (d, *J* = 2.3), 141.98 (dd, *J* = 14.6, *J* = 247.0), 147.46 (dd, *J* = 3.1, *J* = 9.2), 148.93 (dd, *J* = 14.6, *J* = 247.0), 155.26

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.73 (1F, ddd, *J* = 2.3, *J* = 8.0, *J* = 19.5, Ar-F), -142.07 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F)

MS M/Z (ESI+): 335.1809 (100%, $C_{20}H_{25}F_2O_2$, M + H)

IR: 509, 617, 648, 740, 794, 894, 972, 1072, 1195, 1249, 1365, 1465, 1612, 2870, 2954, 3232, 3402



2',3'-Difluoro-4'-(3-(trimethylsilyl)propoxy)-[1,1'-biphenyl]-4-ol (10)

Quantities used: Compound **5** (2 g, 6.1919 mmol), 4-hydroxybenzeneboronic acid (1.272 g, 9.2879 mmol, $Pd(PPh_3)_4$ (50 mg), THF (40 ml), 2M aqueous sodium carbonate (40 ml). The experimental procedure was as described in the preparation of compound **9**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.35) and recrystalised from petroleum ether (40-60), giving the title compound a white solid.

Yield: 1.7 g (82%)

MP: 88.5 °C

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, $\underline{CH_3}Si\text{-}CH_2$), 0.54 – 0.61 (2H, m, $CH_3Si\text{-}\underline{CH_2}\text{-}CH_2$), 1.75 – 1.86 (2H, m, $CH_2\text{-}\underline{CH_2}\text{-}CH_2OAr$), 3.99 (2H, t, *J* = 7.0, $\underline{CH_2}OAr$), 6.73 (1H, td, *J* = 2.1, *J* = 8.9, Ar), 6.87 (2H, ddd, *J* = 2.1, *J* = 2.8. *J* = 8.9, Ar), 7.01 (1H, ddd, *J* = 2.1, *J* = 8.2, *J* = 8.9, Ar), 7.36 (2H, dddd, *J* = 1.5, *J* = 3.1, *J* = 3.4, *J* = 8.5, Ar)

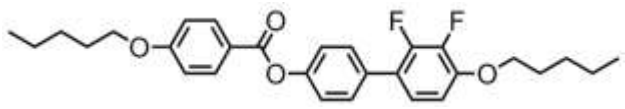
^{13}C NMR (100.5 MHz, $CDCl_3$): -1.77, 1.00, 12.36, 23.77, 72.48, 109.69 (d, *J* = 3.1), 115.56, 122.73 (d, *J* = 11.5), 123.39 (t, *J* = 3.8), 127.61, 130.16 (d, *J* = 3.1), 141.98 (dd, *J* = 14.6, *J* = 246.3), 147.46 (dd, *J* = 3.1, *J* = 8.4), 148.89 (dd, *J* = 10.7, *J* = 247.8), 155.29

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.79 (1F, dd, *J* = 6.9, *J* = 25.29, Ar-F), -142.00 (1F, dd, *J* = 6.9, *J* = 25.29, Ar-F)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.50 (s, $(CH_3)_3\text{-}\underline{Si}\text{-}CH_2$)

MS M/Z (ESI+): 359.1264 ($C_{18}H_{22}F_2NaO_2Si$, M + Na), 337.1441 (100%, $C_{18}H_{23}F_2O_2Si$, M + H)

IR: 524, 617, 694, 748, 833, 1072, 1180, 1242, 1288, 1388, 1442, 1504, 1612, 2885, 2954, 3248



2',3'-Difluoro-4'-(pentyloxy)-[1,1'-biphenyl]-4-yl 4-(pentyloxy)benzoate (16)

Compound **8** (300 mg, 1.0274 mmol), compound **12** (228 mg, 1.0274 mmol), EDAC (294 mg, 1.5411 mmol), DMAP (catalytic) were dissolved into DCM (10 ml), and the resulting solution stirred for 18 h. The solvent was removed *in vacuo* and the crude residues purified by flash chromatography with DCM as the eluent (*Rf* = 0.9) followed by recrystallisation from ethanol, giving the title compound as fine white needles.

Yield: 376 mg (74%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.87 (6H, t, *J* = 7.32, 2 x $\underline{CH_3}$-CH_2), 1.27 – 1.47 (8H, m, 2 x CH_3-($\underline{CH_2}$)$_2$-CH_2), 1.76 (4H, m, 2 x CH_2-$\underline{CH_2}$-CH_2O), 3.97 (2H, t, *J* = 7.32, CH_2-$\underline{CH_2}$-OC_6H_4), 4.00 (3H, t, *J* = 7.32, CH_2-$\underline{CH_2}$-$OC_6H_2F_2$), 6.72 (1H, ddd, *J* = 2.1, *J* = 7.3, *J* = 8.9, Ar-H), 6.90 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar), 7.02 (1H, td, *J* = 2.1, *J* = 8.9, Ar), 7.19 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.5, Ar), 7.47 (2H, dddd, *J* = 1.2, *J* = 3.1, *J* = 3.4, *J* = 8.5, Ar), 8.08 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar)

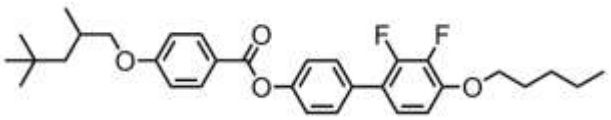
^{13}C NMR (100.5 MHz, $CDCl_3$): 13.99, 22.40, 22.42, 28.01, 29.11, 28.77, 28.83, 68.30, 69.84**,** 109.52 (d, *J* = 3.1), 114.29, 121.38, 121.92, 122.15 (d, *J* = 11.5), 123.55 (t, *J* = 4.6), 129.78 (d, *J* = 3.1), 132.30, 132.42, 141.84 (dd, *J* = 15.3, *J* = 247.8), 147.89 (dd, *J* = 3.1, *J* = 8.4), 148.86 (dd, *J* = 11.5, *J* = 247.8), 150.56, 163.58, 164.91

^{19}F NMR (376.4 MHz, CDCl3): -158.62 (dd, *J* = 6.9, *J* = 19.5, Ar-F), -141.66 (dd, *J* = 6.9, *J* = 19.5, Ar-F)

MS M/Z (ESI+): 505.2148 (100%, $C_{29}H_{32}F_2NaO_4$, M+Na), 483.2345 ($C_{29}H_{33}F_2O_4$, M+H)

IR: 756, 794, 887, 1018, 1072, 1165, 1211, 1465, 1604, 1720, 1913, 2330 2870, 2954

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.62%



2',3'-Difluoro-4'-(pentyloxy)-[1,1'-biphenyl]-4-yl 4-((2,4,4-trimethylpentyl)oxy)benzoate (17)

Quantities used: Compound **8** (300 mg, 1.027 mmol) compound **14** (271 mg, 1.084 mmol),, EDAC (294 mg, 1.541 mmol), DMAP (catalytic), DCM (2ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.9) and recrystalised from ethanol/acetone (15:1), giving the title compound as white plates.

Yield: 411 mg (76%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.83 – 0.90 (12H, M, $C\underline{H}_3$-$(CH_2)_4$OAr + $(C\underline{H}_3)_3$-C), 0.98 – 1.09 (3H, d, *J* = 6.7, $\underline{CH}_3$-CH), 1.05 (1H, dd, *J* = 6.1, *J* = 14.0, $(CH_3)_3$C-C<u>H</u>H-CH(CH_3)-), 1.27 – 1.45 (5H, m CH_3-$(\underline{CH}_2)_2$-CH_2 + CH<u>H</u>-$C(CH_3)_3$), 1.76 (2H, Quintet, *J* = 7.0, OCH_2-$\underline{CH}_2$-CH_2), 1.89 – 2.01 (1H, m, (CH_3)-C<u>H</u>-CH_2OAr), 3.66 (1H, dd, *J* = 7.32, *J* = 8.9, (CH_3)CH-C<u>H</u>HOAr), 3.79 (1H, dd, *J* = 5.8, *J* = 8.9, (CH_3)CH-CH<u>H</u>OAr), 3.98 (2H, t, *J* = 6.7, CH_2O), 6.75 (1H, ddd, *J* = 1.8, *J* = 8.2, *J* = 8.9, Ar-H), 6.89 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 9.2, Ar), 7.01 (1H, td, *J* = 2.4, *J* = 8.5, Ar), 7.18 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar), 7.46 (2H, dddd, *J* = 1.5, *J* = 3.4, *J* = 5.5, *J* = 8.5, Ar), 8.07 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar)

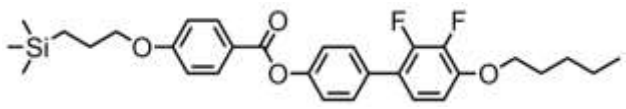
^{13}C NMR (100.5 MHz, $CDCl_3$): 13.97, 19.90, 22.38, 27.99, 28.82, 29.50, 29.84, 30.95, 47.27, 69.81, 73.38, 109.48 (d, *J* = 2.3), 114.31, 121.33, 121.91, 122.12 (d, *J* = 10.7), 123.55 (t, *J* = 3.8), 129.76 (d, *J* = 2.3), 132.28, 132.39, 141.81 (dd, *J* = 14.6, *J* = 247.0), 147.88 (dd, *J* = 3.1, *J* = 8.4), 148.85 (dd, *J* = 10.7, *J* = 248.6), 150.55, 163.67, 164.89

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.61 (1F, ddd, *J* = 2.3, *J* = 5.8, *J* = 19.5, Ar-<u>F</u>), -146.65 (1F, dd, *J* = 5.8, *J* = 19.5, Ar-<u>F</u>)

MS M/Z (ESI+): 547.2622 (100%, $C_{32}H_{38}F_2NaO_4$, M+Na), 525.2836 ($C_{32}H_{39}F_2O_4$, M+H)

IR: 624, 763, 794, 1018, 1064, 1165, 1249, 1465, 1597, 1720, 1913, 2870, 2954

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 98.8%



2',3'-Difluoro-4'-(pentyloxy)-[1,1'-biphenyl]-4-yl 4-(3-(trimethylsilyl)propoxy)benzoate (18)

Quantities used: Compound **8** (300 mg, 1.027 mmol), compound **15** (258 mg, 1.027 mmol), EDAC (294 mg, 1.541 mmol), DMAP (catalytic), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.9) and recrystalised from ethanol/acetone (20:1), giving the title compound as white plates.

Yield: 470 mg (87%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, $(\underline{CH_3})_3Si$), 0.59 (2H, m, CH_2-$\underline{CH_2}$-$Si(CH_3)_3$), 0.90 (3H, t, *J* = 7.0, $\underline{CH_3}$-CH_2), 1.31 – 1.48 (4H, m, CH_3-$(\underline{CH_2})_2$-CH_2), 1.81 (2H, Quintet, *J* = 7.0, OCH_2-$\underline{CH_2}$-CH_2), 3.99 (2H, t, *J* = 7.0, $O\underline{CH_2}$-CH_2-CH_2-$Si(CH_3)_3$), 4.04 (2H, t, *J* = 7.0, CH_2O), 6.75 (1H, ddd, *J* = 1.8, *J* = 7.7, *J* = 8.8, Ar-H), 6.83 (2H, ddd, *J* = 2.2, *J* = 2.9, *J* = 8.8, Ar), 7.05 (1H, td, *J* = 2.2, *J* = 8.8, Ar), 7.23 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar), 7.31 (2H, dddd, *J* = 1.5, *J* = 2.9, *J* = 3.7, *J* = 8.8, Ar), 8.11 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): -1.78, 12.51, 13.97, 22.38, 23.68, 27.99, 28.82, 69.81, 70.90, 109.47 (d, *J* = 3.1), 114.26, 121.36, 121.91, 122.12 (d, *J* = 10.7), 123.54 (t, *J* = 4.6), 129.76 (d, *J* = 3.1), 123.29, 123.39, 141.81 (dd, *J* = 15.3, *J* = 247.0), 147.90 (dd, *J* = 2.3, *J* = 7.7), 148.84 (dd, *J* = 10.7, *J* = 249.3), 150.54, 163.52, 164.88

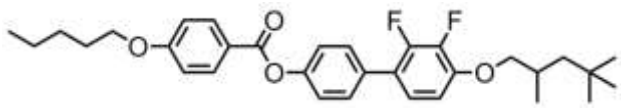
^{19}F NMR (376.4 MHz, $CDCl_3$): -158.62 (1F, ddd, *J* = 2.3, *J* = 8.0, *J* = 19.5, Ar-$\underline{F}$), -141.66 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-$\underline{F}$)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.47 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 549.2158 (100%, $C_{30}H_{36}F_2O_4Si$, M+Na), 527.2398 ($C_{30}H_{37}$, F_2O_4Si, M+H)

IR: 493, 532, 617, 694, 756, 840, 1002, 1064, 1165, 1249, 1396, 1465, 1597, 1728, 2870, 2954

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.0%



2',3'-Difluoro-4'-(4-((2,4,4-trimethylpentyl)oxy)-[1,1'-biphenyl]-4-yl 4-(pentyloxy)benzoate (19)

Quantities used: Compound **9** (200 mg, 0.5988 mmol), compound **13** (146.2 mg, 0.6586 mmol), EDAC (171.6 mg, 0.898 mmol), DMAP (catalytic), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.95) and recrystalised from ethanol, giving the title compound as fine white needles.

Yield: 220 mg (68%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.84 – 0.91 (12H, m, $(\underline{CH_3})_3C$ + CH_2-$\underline{CH_3}$), 1.04 (3H, d *J* = 6.7, $\underline{CH_3}$-CH), 1.07 (1H, dd, *J* = 6.1, *J* = 14.3, $(CH_3)_3C$-C$\underline{H}$H-$CHCH_3$-), 1.28 – 1.51 (5H, m, CH_3-$(\underline{CH_2})_2$-CH_2 + $(CH_3)_3C$-CH$\underline{H}$-$CHCH_3$-), 1.76 (2H, Quintet, *J* = 6.7, CH_3-$(CH_2)_2$-$\underline{CH_2}$-CH_2OAr), 1.93 – 2.05 (1H, m, $(CH_3)_3C$-CH_2-C$\underline{H}CH_3$-), 3.68 (1H, dd, *J* = 7.6, *J* = 8.9, CH_3CH-C$\underline{H}$HOAr), 3.82 (1H, dd, *J* = 5.8, *J* = 8.9, CH_3CH-CH$\underline{H}$OAr), 3.97 (2H, t, *J* = 6.7, CH_2OAr), 6.71 (1H, m,, 6.91 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar), 7.02 (1H, td, *J* = 2.1, *J* = 8.5, Ar), 7.46 (2H, m, Ar), 8.08 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar)

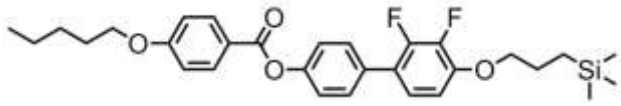
^{13}C NMR (100.5 MHz, $CDCl_3$): 14.00, 19.87, 22.42, 28.11, 28.77, 29.62, 29.82, 30.98, 47.20, 68.30, 75.80, 109.47 (d, *J* = 2.3), 114.28, 121.38, 121.92, 121.10 (d, *J* = 10.7), 123.53 (t, *J* = 3.8), 129.78 (d, *J* = 3.1), 132.23, 132.43, 141.81 (dd, *J* = 14.6, *J* = 247.0), 148.06 (dd, *J* = 2.3, *J* = 7.7), 148.81 (dd, *J* = 10.7, *J* = 248.6), 150.54, 163.67, 164.92

^{19}F NMR (376.4 MHz, CDCl3): -158.56 (1F, ddd, *J* = 2.3, *J* = 8.0 *J* = 19.5, Ar-F), -141.71 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F)

MS M/Z (ESI+): 547.2625 ($C_{32}H_{38}F_2NaO_4$, M + Na), 525.2786 (100%, $C_{32}H_{39}F_2O_4$, M + H)

IR: 524, 617, 756, 794, 887, 1018, 1064, 1172, 1203, 1249, 1311, 1404, 1465, 1604, 1728, 2870, 2939

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.4%



2',3'-Difluoro-4'-(3-(trimethylsilyl)propyloxy)-1,1'-biphenyl]-4-yl 4-(pentyloxy)benzoate (20)

Quantities used: Compound **10** (150 mg, 0.4464 mmol), compound **13** (208 mg, 1 mmol), EDAC (191 mg, 1 mmol), DMAP (cat), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.95) and recrystalised from ethanol, giving the title compound as colourless plates.

Yield: 230 mg (95%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, $(\underline{CH_3})_3Si$), 0.59 (2H, m, CH_2-$\underline{CH_2}$-$Si(CH_3)_3$), 0.91 (3H, t, *J* = 7.0, $\underline{CH_3}$-CH_2), 1.30 – 1.48 (4H, m, CH_3-$(\underline{CH_2})_2$-CH_2 + $(CH_3)_3Si$-CH_2-$\underline{CH_2}$-CH_2O), 1.74 – 1.86 (2H, m, OCH_2-$\underline{CH_2}$-CH_2), 3.97 – 4.04 (4H, m,$O\underline{CH_2}$-C_4H_9 + $O\underline{CH_2}$-CH_2-CH_2-$Si(CH_3)_3$), 6.75 (1H, ddd, *J* = 1.8, *J* = 7.7, *J* = 9.2, Ar-H), 6.93 (2H, ddd, *J* = 1.8, *J* = 2.9, *J* = 8.8, Ar), 7.05 (1H, td, *J* = 1.8, *J* = 8.8, Ar), 7.23 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.8, Ar), 7.48 – 7.54 (2H, m, Ar), 8.11 (2H, ddd, *J* = 2.2, *J* = 2.6, *J* = 9.2, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): -1.66, 12.47, 14.09, 22.53, 23.88, 28.22, 28.88, 68.41, 72.57, 109.66 (d, *J* = 3.1), 114.40, 121.50, 122.03, 122.27 (d, *J* = 10.4), 123.68 (t, *J* = 4.9), 129.89 (d, *J* = 3.1), 132.40, 132.52, 141.93 (dd, *J* = 14.6, *J* = 246.20), 148.80 (dd, *J* = 3.1, *J* = 11.5), 148.99 (dd, *J* = 11.5, *J* = 246.2), 150.68, 163.70, 165.00

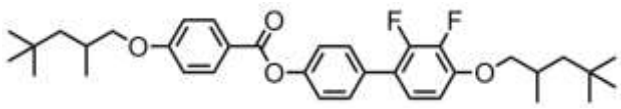
^{19}F NMR (376.4 MHz, $CDCl_3$): -158.6 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F), -141.61 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.51 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 549.2249 ($C_{30}H_{36}F_2NaO_4Si$, M + Na), 527.2402 (100%, $C_{30}H_{37}F_2O_4Si$, M + H)

IR: 617, 686, 848, 1010, 1072, 1165, 1249, 1396, 1465, 1604, 1728, 2870, 2954

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.3%



2',3'-Difluoro-4'-(4-((2,4,4-trimethylpentyl)oxy)-[1,1'-biphenyl]-4-yl 4-((2,4,4-trimethylpentyl)oxy)benzoate (21)

Quantities used: Compound **9** (200 mg, 0.5988 mmol), compound **14** (164.7 mg, 0.6588 mmol), EDAC (171.6 mg, 0.898 mmol), DMAP (catalytic), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.95) and recrystalised from ethanol, giving the title compound as colourless plates.

Yield: 170 mg (51%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.87 (18H, s, 2x ($\underline{CH_3}$)$_3$-C), 0.98 – 1.11 (8H, m, 2x $\underline{CH_3}$-CH + 2x $(CH_3)_3$C-C$\underline{H}$H-$CHCH_3$-), 1.29 – 1.38 (2H, m, 2x $(CH_3)_3$C-CH$\underline{H}$-$CHCH_3$-), 1.90 – 2.05 (2H, m, 2x $(CH_3)_3$C-CH_2-C$\underline{H}CH_3$-), 3.64 – 3.72 (2H, m, 2x CH_3CH-C$\underline{H}$HOAr), 3.76 – 3.86 (2H, m, 2x CH_3CH-CH$\underline{H}$OAr), 6.71 (1H, ddd, *J* = 1.8, *J* = 7.6, *J* = 9.2, Ar), 6.90 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 9.2, Ar), 7.02 (1H, td, *J* = 2.4, *J* = 8.5, Ar) 7.20 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 8.9, Ar), 7.47 (2H, dddd, *J* = 2.1, *J* = 2.8, *J* = 3.4, *J* = 8.9, Ar), 8.08 (2H, ddd, *J* = 2.1, *J* = 2.8, *J* = 9.2, Ar)

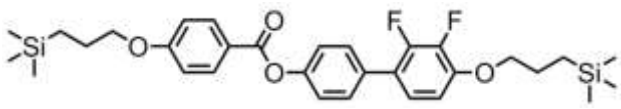
^{13}C NMR (100.5 MHz, $CDCl_3$): 21.08, 21.13, 30.72, 30.82, 31.03, 31.06, 32.18, 48.40, 48.49, 75.59, 77.00, 110.65 (d, *J* = 2.3), 115.52, 122.55, 123.13, 123.20 (d, *J* = 10.7), 124.72 (t, *J* = 3.8), 130.99 (d, *J* = 3.1), 133.49, 133.64, 142.95 (dd, *J* = 14.6, *J* = 247.0), 149.22 (dd, *J* = 2.3, *J* = 7.7), 151.29 (dd, *J* = 10.7, *J* = 248.6), 151.71, 164.84, 166.12

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.55 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F), -141.71 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F)

MS M/Z (ESI+): 589.3093 ($C_{35}H_{44}F_2NaO_4$, M + Na), 567.3263 (100%, $C_{35}H_{45}F_2O_4$, M + H)

IR: 686, 763, 794, 879, 979, 1072, 1165, 1249, 1465, 1604, 1728, 2870, 2954

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.2%



2',3'-Difluoro-4'-(3-(trimethylsilyl)propoxy)-[1,1'-biphenyl]-4-yl 4-(3-(trimethylsilyl)propoxy)benzoate (22)

Quantities used: Compound **10** (150 mg, 0.4464 mmol), compound **15** (252 mg, 1 mmol), EDAC (191 mg, 1 mmol), DMAP (cat), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.95) and recrystalised from ethanol, giving the title compound as a white solid.

Yield: 190 mg (75%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (18H, s, 2x $(\underline{CH_3})_3Si$), 0.55 – 0.63 (4H, m, CH_2-$\underline{CH_2}$-$Si(CH_3)_3$), 1.72 – 1.88 (4H, m, 2x $(CH_3)_3Si$-CH_2-$\underline{CH_2}$-CH_2O), 3.94 – 4.03 (4H, m, 2x CH_2OAr), 6.72 – 6.79 (1H, m,, 6.94 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar), 7.06 (1H, td, *J* = 2.1, *J* = 8.5, Ar), 7.23 (2H, ddd, *J* = 1.8, *J* = 2.9, *J* = 8.8, Ar), 7.51 (2H, m, Ar), 8.12 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.8, Ar),

^{13}C NMR (100.5 MHz, $CDCl_3$): -1.65, 12.47, 12.64, 23.81, 23.88, 71.03, 72.57, 109.66 (d, *J* = 3.1), 114.40, 121.51, 122.03, 122.25 (d, *J* = 10.4), 123.68 (t, *J* = 4.9), 129.89 (d, *J* = 3.1), 123.42, 132.52, 141.88 (dd, *J* = 11.5, *J* = 247.2), 148.00 (dd, *J* = 3.1, *J* = 11.5), 148.81 (dd, *J* = 11.5, *J* = 247.2), 150.68, 163.65, 165.00

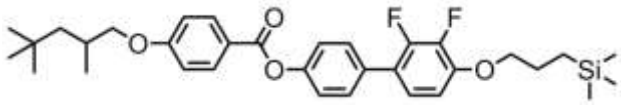
^{19}F NMR (376.4 MHz, $CDCl_3$): -158.60 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F), -141.62 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.47 (s, $(CH_3)_3\underline{Si}$-CH_2), 2.51 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 593.2323 ($C_{31}H_{40}F_2NaO_4Si_2$, M + Na), 571.2486 (100%, $C_{31}H_{41}F_2O_4Si_2$, M + H)

IR: 624. 686. 756, 840, 1002, 1072, 1157, 1195, 1249, 1465, 1604, 1720, 2877, 2947

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 98.5%



2',3'-Difluoro-4'-(3-(trimethylsilyl)propoxy)-[1,1'-biphenyl]-4-yl 4-((2,4,4-trimethylpentyl)oxy)benzoate (23)

Quantities used: Compound **10** (150 mg, 0.4464 mmol), compound **14** (250 mg, 1 mmol), EDAC (191 mg, 1 mmol), DMAP (cat), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.9) and recrystalised from ethanol, giving the title compound as colourless plates.

Yield: 210 mg (80%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, $(\underline{CH_3})_3Si$), 0.56 – 0.60 (2H, m, CH_2-$\underline{CH_2}$-$Si(CH_3)_3$), 0.91 (9H, s, $(\underline{CH_3})_3$-CH_2), 1.06 (3H, d, *J* = 7.0, CH_2-$(\underline{CH_3})CH$-CH_2), 1.08 (1H, dd, *J* = 6.1, *J* = 14.3, $(CH_3)_3C$-$C\underline{H}H$-$CHCH_3$-), 1.38 (1H, dd, *J* = 3.7, *J* = 13.9, $(CH_3)_3C$-$CH\underline{H}$-$CHCH_3$-), 1.76 (2H, m, CH_3-$(CH_2)_2$-$\underline{CH_2}$-CH_2OAr), 1.94 – 2.05 (1H, m, $(CH_3)_3C$-CH_2-$C\underline{H}CH_3$-), 3.71 (1H, dd, *J* = 7.3, *J* = 8.8, CH_3CH-$C\underline{H}HOAr$), 3.83 (1H, dd, *J* = 5.4, *J* = 8.8, CH_3CH-$CH\underline{H}OAr$), 3.99 (2H, t, *J* = 7.0, CH_2OAr), 6.75 (1H, m,, 6.92 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar), 7.06 (1H, td, *J* = 2.1, *J* = 8.5, Ar), 7.23 (2H, ddd, *J* = 1.8, *J* = 2.9, *J* = 8.8, Ar), 7.50 (2H, m, Ar), 8.11 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.8, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): 19.97, 29.73, 29.93, 31.07, 47.31, 75.98, 109.62 (d, *J* = 3.1), 115.56, , 122.66 (d, *J* = 10.4), 123.32 (t, *J* = 4.9), 130.17 (d, *J* = 3.1), 141.98 (dd, *J* = 10.7, *J* = 247.2), 147.65 (dd, *J* = 3.1, *J* = 11.5), 148.93 (dd, *J* = 10.7, *J* = 247.2), 155.26, 163.70, 165.00

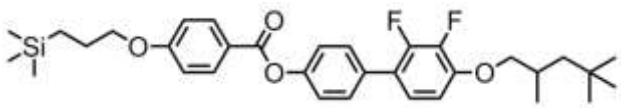
^{19}F NMR (376.4 MHz, $CDCl_3$): -158.58 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F), -141.60 (1F, dd, *J* = 8.0, *J* = 19.5, Ar-F)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.50 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 591.2725 ($C_{33}H_{42}F_2NaO_4Si$, M + Na), 569.2883 (100%, $C_{33}H_{42}F_2O_4Si$, M + Na)

IR: 617, 686, 848, 1018, 1072, 1165, 1249, 1465, 1604, 1728, 2870, 2954

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.4%



2',3'-Difluoro-4'-((2,4,4-trimethylpentyl)oxy)-[1,1'-biphenyl]-4-yl 4-(3-(trimethylsilyl)propoxy)benzoate (24)

Quantities used: Compound **9** (200 mg, 0.5988 mmol), compound **14** (165.9 mg, 0.6586 mmol), EDAC (171.6 mg, 0.898 mmol), DMAP (catalytic), DCM (5 ml). The experimental procedure was as described in the preparation of compound **16**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.9) and recrystalised from ethanol, giving the title compound as white plates.

Yield: 310 mg (91%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, $(\underline{CH_3})_3Si$), 0.55 – 0.63 (2H, m, CH_2-$\underline{CH_2}$-$Si(CH_3)_3$), 0.91 (9H, s, $(\underline{CH_3})_3$-CH_2), 1.07 (3H, d, *J* = 6.7, CH_2-$(\underline{CH_3})$CH-CH_2), 1.09 (1H, dd, *J* = 5.8, *J* = 14.0, $(CH_3)_3$C-C$\underline{H}$H-$CHCH_3$-), 1.37 (1H, dd, *J* = 3.7, *J* = 14.0, $(CH_3)_3$C-CH$\underline{H}$-$CHCH_3$-), 1.72 – 1.84 (2H, m, CH_3-$(CH_2)_2$-$\underline{CH_2}$-CH_2OAr), 1.95 – 2.08 (1H, m, $(CH_3)_3$C-CH_2-C$\underline{H}$$CH_3$-), 3.72 (1H, dd, *J* = 7.6, *J* = 8.2, CH_3CH-C$\underline{H}$HOAr), 3.85 (1H, dd, *J* = 5.8, *J* = 8.9, CH_3CH-CH$\underline{H}$OAr), 3.97 (2H, t, *J* = 6.7, CH_2OAr), 6.74 (1H, m,, 6.91 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.9, Ar), 7.05 (1H, td, *J* = 2.1, *J* = 8.5, Ar), 7.24 (2H, ddd, *J* = 1.8, *J* = 2.9, *J* = 8.8, Ar), 7.51 (2H, m, Ar), 8.13 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.8, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): -1.65, 12.64, 19.97, 23.81, 29.74, 29.94, 31.07, 47.31, 71.03, 109.59 (d, *J* = 3.4), 114.40, 121.51 122.02, 122.61 (d, *J* = 10.4), 123.28 (t, *J* = 4.9), 129.90 (d, *J* = 3.1), 132.42, 132.55, 141.95 (dd, *J* = 10.7, *J* = 247.2), 147.61 (dd, *J* = 3.4, *J* = 11.5), 148.91 (dd, *J* = 10.7, *J* = 247.2), 150.66, 163.65, 165.02

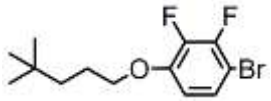
^{19}F NMR (376.4 MHz, $CDCl_3$): -158.57 (1F, dd, *J* = 19.4, 6.9, Ar-F), -142.12 (1F, dd, *J* = 19.4, 6.9, Ar-F)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.46 (s, $(CH_3)_3\underline{Si}$-CH_2)

MS M/Z (ESI+): 591.2730 ($C_{23}H_{42}F_2NaO_4Si$, M + Na), 569.2885 (100%, $C_{33}H_{43}F_2O_4Si$, M + H)

IR: 509, 617, 756, 794, 1018, 1064, 1165, 1203, 1249, 1404, 1465, 1604, 1728, 2870, 2939

Assay (HPLC, C18, 235/260 nm, 100% H_3CCN): 99.0%



4-(4,4-Dimethylpentyloxy)-2,3-difluorobromobenzene (26)

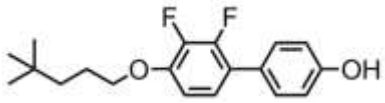
Quantities used: 4,4-Dimethylpentanol (2.3 g, 20 mmol), 4-bromo-2,3-difluorophenol (4.2 g, 20 mmol), Triphenylphosphine (5.5 g, 20 mmol), DIAD (4 g, 3.9 ml, 20 mmol), anhydrous THF (40 ml). The experimental procedure was as described in the synthesis of compound **4**. The title compound was isolated as a colourless oil *via* flash chromatography with DCM as the eluent (*Rf* = 0.95).

Yield: g (79 %)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.76 (9H, s, $(\underline{CH_3})_3C$), 1.01 – 1.11 (2H, m, CH_2-$\underline{CH_2}$-$C(CH_3)_3$), 1.30 – 1.40 (2H, m, OCH_2-$\underline{CH_2}$-CH_2), 3.90 (2H, t, *J* = 6.7 Hz, $\underline{CH_2}O$), 6.50 – 6.57 (1H, m, Ar), 7.02 – 7.09 (1H, m, Ar)

^{19}F NMR (376.4 MHZ, $CDCl_3$): -154.66 (1F, ddd, *J* = 2.3 Hz, *J* = 6.9 Hz, *J* = 20.7 Hz, Ar-F), -129.1 (1F, ddd, *J* = 2.3 Hz, *J* = 6.9 Hz, *J* = 20.7 Hz, Ar-F)

MS M/Z (ESI+): 308.0197 [100%, $C_{13}H_{17}F_2OBr$, M + H]



4'-((4,4-Dimethylpentyl)oxy)-2',3'-difluoro-[1,1'-biphenyl]-4-ol (27)

Quantities used: Compound **26** (2 g, 6.4 mmol), 4-hydroxybenzeneboronic acid (0.969 g, 7.03 mmol, $Pd(PPh_3)_4$ (50 mg), THF (20 ml), 2M aqueous sodium carbonate (20 ml). The experimental procedure was as described in the preparation of compound **9**. The title compound was purified by flash chromatography with DCM as the eluent (*Rf* = 0.35) and recrystalised from petroleum ether (40-60), giving the title compound a white solid.

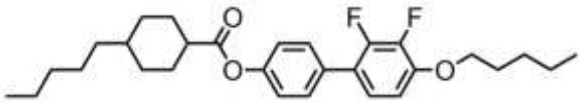
Yield: 1.4 g (67%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.94 (9H, s, $(\underline{CH_3})_3C\text{-}CH_2$), 1.32– 1.37 (2H, m, $(CH_3)_3C\text{-}\underline{CH_2}\text{-}CH_2$), 1.78 – 1.88 (2H, m, $CH_2\text{-}\underline{CH_2}\text{-}CH_2OAr$), 4.05 (2H, t, *J* = 7.0, $\underline{CH_2}OAr$), 4.98 (1H, Broad S, Ar-O$\underline{H}$), 6.77 (1H, td, *J* = 2.3, *J* = 8.5, Ar), 6.90 (2H, ddd, *J* = 1.8, *J* = 2.8, *J* = 8.5, Ar), 7.05 (1H, ddd, *J* = 2.3, *J* = 8.2, *J* = 8.5, Ar), 7.40 (2H, dddd, *J* = 1.5, *J* = 2.3, *J* = 3.4, *J* = 8.5, Ar)

^{13}C NMR (100.5 MHz, $CDCl_3$): 24.57, 29.28, 30.15, 39.86, 70.74, 109.54 (d, *J* = 2.3), 115.43, 122.61 (d, *J* = 10.7), 123.26 (t, *J* = 3.8), 127.55, 130.06 (d, *J* = 3.1), 141.86 (dd, *J* = 14.6, *J* = 247.0), 147.37 (dd, *J* = 3.1, *J* = 8.4), 148.68 (dd, *J* = 10.7, *J* = 247.8), 155.07

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.74 (1F, dd, *J* = 6.9, *J* = 19.5, Ar-F), -141.98 (1F, dd, *J* = 6.9, *J* = 19.5, Ar-F)

MS M/Z (ESI+): 345.0787 ($C_{18}H_{22}F_2NaO_2C$, M + Na)



2',3'-Difluoro-4'-(pentyloxy)-[1,1'-biphenyl]-4-yl 4-pentylcyclohexane-1-carboxylate (4)

Quantities used: Compound **8** (200 mg, 0.654 mmol), 4-pentylcyclohexanecarboxylic acid (202 mg, 1 mmol), EDAC (191 mg, 1 mmol), DMAP (50 mg), DCM (4 ml). The reaction procedure was as described in the synthesis of compound **16**, the title compound was obtained as colourless needles following recrystalisation from ethanol/THF.

Yield: 224 mg (69%)

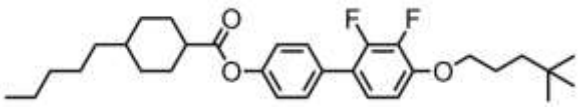
^{1}H NMR (400 MHZ, $CDCl_3$): 0.79 – 0.97 (8H, m), 1.08 – 1.56 (15H, m), 1.71 – 1.85 (4H, m), 2.01 – 2.11 (2H, m, Cy$\underline{H}_2$), 2.41 (1H, tt, *J* = 3.2 Hz, *J* = 12.2 Hz, Cy$\underline{H}$COOAr), 3.98 (2H, t, *J* = 7.0 Hz, ArOC$\underline{H}_2$), 6.70 (1H, td, *J* = 1.8 Hz, *J* = 8.7 Hz, Ar$\underline{H}$), 6.97 (1H, td, *J* = 2.3 Hz, *J* = 8.2 Hz, Ar$\underline{H}$), 7.05 (2H, ddd, *J* = 1.8 Hz, *J* = 2.8 Hz, *J* = 8.7 Hz, Ar$\underline{H}$), 7.39 – 7.44 (2H, m, Ar$\underline{H}$)

^{13}C NMR (100.5 MHz, $CDCl_3$): 14.09, 14.19, 22.52, 22.78, 26.63, 28.10, 28.93, 29.10, 32.24, 32.36, 37.01, 37.24, 43.74, 69.93, 109.59 (d, *J* = 2.3 Hz), 121.77, 122.21 (d, *J* = 10.5 Hz), 123.63 (t, *J* = 3.8 Hz), 129.81 (d, *J* = 2.9 Hz), 132.45 (m), 141.78 (dd, *J* = 15.3 Hz, *J* = 247.3 Hz), 148.01 (dd, *J* = 2.9 Hz, *J* = 8.6 Hz), 148.95 (dd, *J* = 11.5 Hz, *J* = 249.2 Hz), 150.46, 174.79

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.64 (1F, ddd, *J* = 2.3 Hz, *J* = 8.0 Hz, *J* = 19.5 Hz, Ar*F*), -141.72 (1F, dd, *J* = 8.0 Hz, *J* = 19.5 Hz, Ar*F*)

MS M/Z (ESI+): 495.3313 [100%, $C_{29}H_{38}NaF_2O_3$, M + Na], 473.2798 [$C_{29}H_{39}F_2O_3$, M + H]

Assay (HPLC, 250/275 nm, 100% H_3CCN): 99.9%



2',3'-Difluoro-4'-(4,4-dimethylpentyloxy)-[1,1'-biphenyl]-4-yl 4-hexylcyclohexane-1-carboxylate (30)

Quantities used: Compound **27** (150 mg, 0.469 mmol), 4-pentylcyclohexanecarboxylic acid (150 mg, 0.694 mmol), EDAC (191 mg, 1 mmol), DMAP (50 mg), DCM (5 ml). The reaction procedure was as described in the synthesis of compound **16**, the title compound was obtained as colourless needles following recrystalisation from ethanol.

Yield: 210 mg (86%)

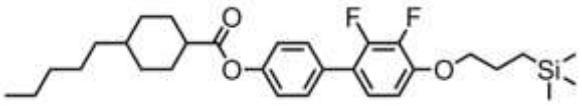
^{1}H NMR (400 MHZ, $CDCl_3$): 0.87 – 1.06 (14H, m), 1.18 – 1.38 (14H, m), 1.57 (2H, dQuart, *J* = 3.4, *J* = 13.1, (Cy)$\underline{H_2}$), 1.77 – 1.92 (3H, m, (Cy)$\underline{H_2}$ + (Cy)$\underline{H}$), 2.11 – 2.18 (2H, m, (Cy)$\underline{H_2}$), 2.47 (1H, tt, *J* = 3.4, *J* = 12.2, (Cy)$\underline{H}$), 4.05 (2H, t, *J* = 6.7, ArOC$\underline{H_2}$), 6.76 (1H, ddd, *J* = 1.8, *J* = 7.6, *J* = 9.2, Ar$\underline{H}$), 7.05 (1H, ddd, *J* = 2.1, *J* = 2.4, *J* = 8.9, Ar$\underline{H}$), 7.10 (2H, ddd, *J* =2.1, *J* =2.8, *J* =8.9, Ar$\underline{H}$), 7.49 (2H, dddd, *J* = 1.5, *J* =2.8, *J* =3.7, *J* =8.9, Ar$\underline{H}$)

^{13}C NMR (100.5 MHz, $CDCl_3$): 14.22, 22.78, 24.68, 26.99, 29.39, 29.45, 29.99, 31.99, 32.36, 37.01, 37.28, 39.98, 43.74, 70.76, 109.63 (d, *J* = 1.9 Hz), 121.77, 122.24 (d, *J* = 11.5 Hz), 123.64 (t, *J* = 3.8 Hz), 129.81 (d, *J* = 2.9 Hz), 132.44 (m), 141.92 (dd, *J* = 15.3 Hz, *J* = 247.3 Hz), 148.00 (dd, *J* = 2.9 Hz, *J* = 8.6 Hz), 148.94 (dd, *J* = 11.5 Hz, *J* = 248.2 Hz), 150.46, 174.79

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.51 (1F, ddd, *J* = 2.3, *J* = 8.0, *J* = 19.5, Ar$\underline{F}$), -141.67 (1F, dd, *J* = 8.0, *J* = 19.5, Ar$\underline{F}$),

MS M/Z (ESI+): 523.2998 [100%, $C_{31}H_{42}NaF_2O_3$, M + Na], 501.3078 [$C_{31}H_{42}F_2O_3$, M + H]

Assay (HPLC, 250/275 nm, 100% H_3CCN): 99.7%



2',3'-Difluoro-4'-(3-(trimethylsilyl)propyloxy)-[1,1'-biphenyl]-4-yl 4-pentylcyclohexane-1-carboxylate (31)

Quantities used: Compound **10** (200 mg, 0.593 mmol), 4-pentlycyclohexanecarboxylic acid (186 mg, 1 mmol), EDAC (191 mg, 1 mmol), DMAP (50 mg), DCM (10 ml). The reaction procedure was as described in the synthesis of compound **16**, the title compound was obtained as colourless needles following recrystalisation from ethanol.

Yield: 240 mg (78%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.00 (9H, s, CH_2-Si-($C\underline{H}_3$)$_3$), 0.55 – 0.61 (2H, m, CH_2-$C\underline{H}_2$-Si(CH_3)$_3$), 0.86 (3H, t, *J* = 6.7 Hz, CyH-(CH_2)$_4$-$C\underline{H}_3$), 0.96 (2H, dquint, *J* = 3.2 Hz, *J* = 16.5 Hz, Cy$\underline{H}_2$),1.12– 1.30 (8H, m), 1.48 – 1.58 (2H, dquart, *J* = 3.2, *J* =12.8, $C\underline{H}_2$), 1.76 – 1.89 (2H, m, (Cy)$C\underline{H}_2$), 1.91 – 2.02 (1H, m, $C\underline{H}_2$), 2.06 – 2.15 (2H, m, (Cy)$C\underline{H}_2$), 2.46 (1H, tt, *J* =3.7, *J* =12.4, Cy$\underline{H}$), 3.99 (2H, t, *J* = 7.0, ArO$C\underline{H}_2$), 6.74 (1H, ddd, *J* = 1.8, *J* = *2.1*, *J* = 8.5, Ar$\underline{H}$), 7.03 (1H, ddd, *J* = 1.5, *J* = 2.1, *J* = 7.3, Ar$\underline{H}$), 7.10 (2H, ddd, *J* =2.1, *J* = 2.8, *J* = 8.9, Ar$\underline{H}$), 7.46 (2H, dddd, *J* = 1.5, *J* = 2.1, *J* =3.4, *J* =8.5, Ar$\underline{H}$)

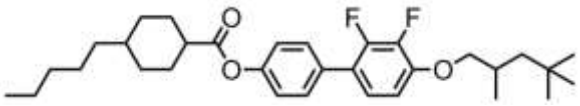
^{13}C NMR (100.5 MHz, $CDCl_3$): -1.67, 1.11, 12.46, 14.20, 22.77, 26.62, 29.11, 32.24, 32.35, 37.00, 37.23, 43.74, 72.54, 109.62 (d, *J* = 1.9 Hz), 121.77, 122.21 (d, *J* = 10.5 Hz), 123.66 (t, *J* = 4.8 Hz), 129.81 (d, *J* = 2.9 Hz), 132.45 (m), 141.90 (dd, *J* = 15.3 Hz, *J* = 247.3 Hz), 147.93 (dd, *J* = 2.9 Hz, *J* = 10.5 Hz), 148.84 (dd, *J* = 11.5 Hz, *J* = 248.2 Hz), 150.45, 174.80

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.64 (1F, ddd, *J* = 2.3, *J* = 8.0, *J* = 19.0, Ar$\underline{F}$), -141.68 (1F, dd, *J* = 8.0, *J* = 19.0 Ar$\underline{F}$)

^{29}Si NMR (79.4 MHz, $CDCl_3$): 2.44 (s, (CH_3)$_3$$\underline{Si\text{-}CH_2}$)

MS M/Z (ESI+): 539.2942 [100%, $C_{30}H_{42}NaF_2O_3Si$, M + Na], 516.2921 [$C_{30}H_{42}F_2O_3Si$, M + H]

Assay (HPLC, 250/275 nm, 100% H_3CCN): 99.6%



2',3'-Difluoro-4'-(2,4,4-trimethylpentyloxy)-[1,1'-biphenyl]-4-yl 4-butylcyclohexane-1-carboxylate (32)

Quantities used: Compound **9** (200 mg, 0.599 mmol), 4-pentlycyclohexanecarboxylic acid (186 mg, 1 mmol), EDAC (191 mg, 1 mmol), DMAP (50 mg), DCM (10 ml). The reaction procedure was as described in the synthesis of compound **16**, the title compound was obtained as colourless needles following recrystalisation from ethanol.

Yield: 212 mg (71%)

^{1}H NMR (400 MHZ, $CDCl_3$): 0.79 – 1.36 (26H, m), 1.43 – 1.56 (2H, dquart, *J* = 3.7, *J* =14.2, C$\underline{H}_2$), 1.74 – 1.86 (2H, m, (Cy)C$\underline{H}_2$), 1.91 – 2.02 (1H, m, C$\underline{H}CH_3$), 2.02 – 2.11 (2H, m, (Cy)C$\underline{H}_2$), 2.41 (1H, tt, *J* =3.7, *J* =11.9, Cy$\underline{H}$), 3.66 (1H, dd, *J* = 7.8, *J* = 9.2, ArOCH$\underline{H}$), 3.80 (1H, dd, *J* = 6.0, *J* = 9.2, ArOC$\underline{H}$H), 6.67 (1H, ddd, *J* = 1.8, *J* = *2.1*, *J* = 8.5, Ar$\underline{H}$), 6.98 (1H, ddd, *J* = 1.5, *J* = 1.8, *J* = 7.3, Ar$\underline{H}$), 7.05 (2H, ddd, *J* =2.1, *J* = 2.8, *J* = 8.9, Ar$\underline{H}$), 7.42 (2H, dddd, *J* = 1.5, *J* = 1.8, *J* =3.4, *J* =8.5, Ar$\underline{H}$)

^{13}C NMR (100.5 MHz, $CDCl_3$): 14.22, 19.97, 22.78, 26.92, 29.11, 29.71, 29.93, 31.07, 32.00, 32.36, 37.01, 37.29, 43.74, 47.31, 75.89, 109.56 (d, *J* = 1.8 Hz), 121.77, 122.15 (d, *J* = 10.5 Hz), 123.59 (t, *J* = 4.8 Hz), 129.80 (d, *J* = 2.9 Hz), 132.48, 141.91 (dd, *J* = 14.4 Hz, *J* = 247.3 Hz), 147.68 (d, *J* = 10.5 Hz), 148.19 (dd, *J* = 2.9 Hz, *J* = 7.7 Hz), 150.14 (d, *J* = 11.5 Hz), 150.45, 174.77

^{19}F NMR (376.4 MHz, $CDCl_3$): -158.55 (1F, ddd, *J* =2.3, *J* =8.0, *J* =19.5, Ar$\underline{F}$), -141.76 (1F, dd, *J* =8.04, *J* =19.5, Ar$\underline{F}$).

MS M/Z (ESI+): 537.3313 [100%, $C_{32}H_{44}NaF_2O_3$, M + Na], 515.3220 [$C_{32}H_{45}F_2O_3$, M + H]

Assay (HPLC, 250/275 nm, 100% H_3CCN): 99.4%

Supplimental 1D NOE data:

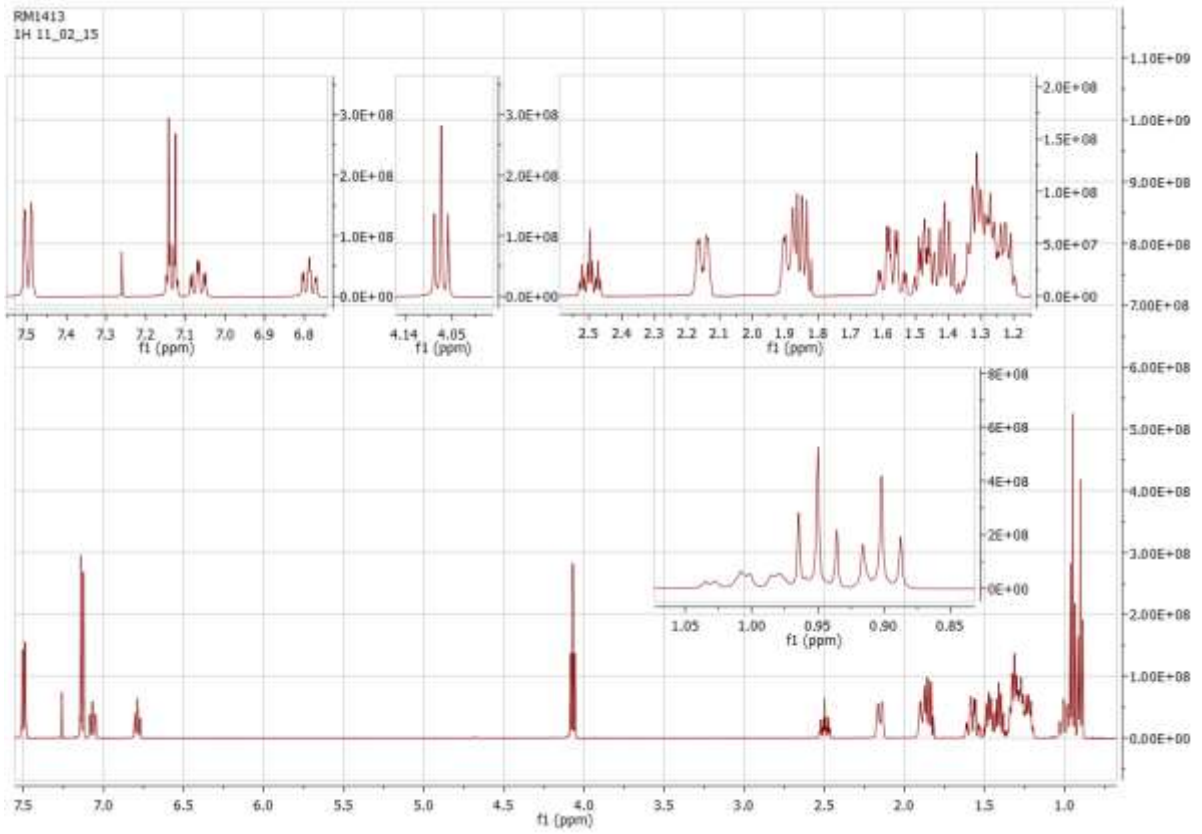


Figure SI1: ^{1}H NMR spectrum of compound **29**, unsaturated.

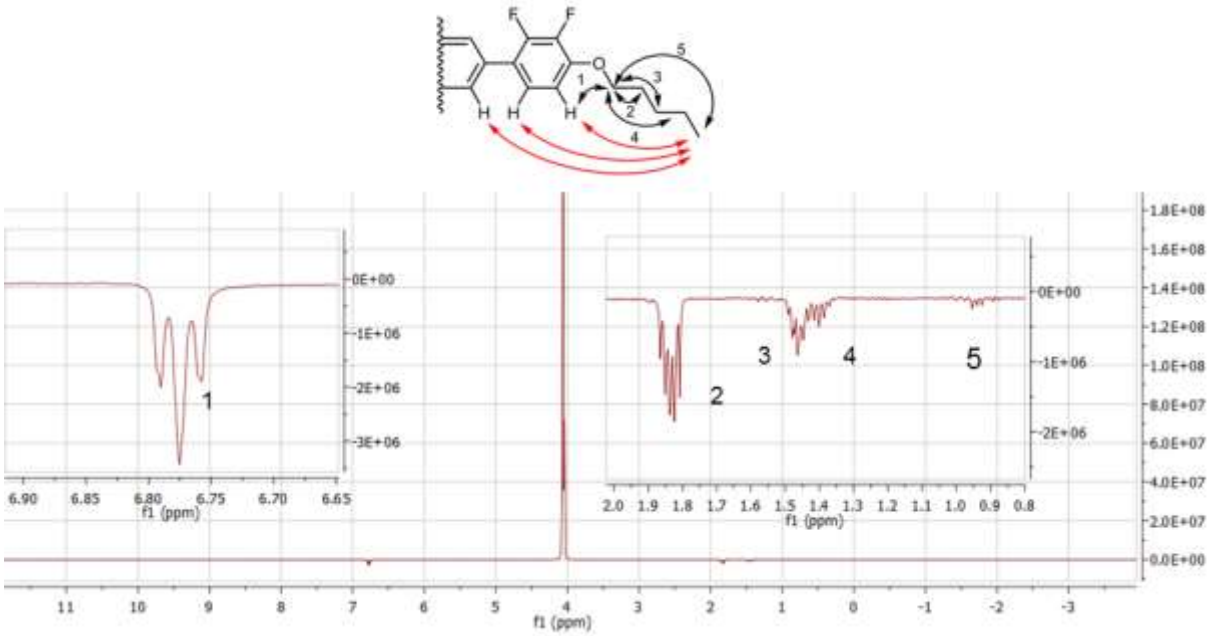


Figure SI2: ^{1}H 1D NOESY NMR spectrum of compound **29** saturated at 491.20 Hz, 0.98 ppm. The large number of signals results from the saturation of both of the CH_3 environments (0.95 and 0.90 ppm respectively) in the molecule and thus a large number of NOE enhancements result.

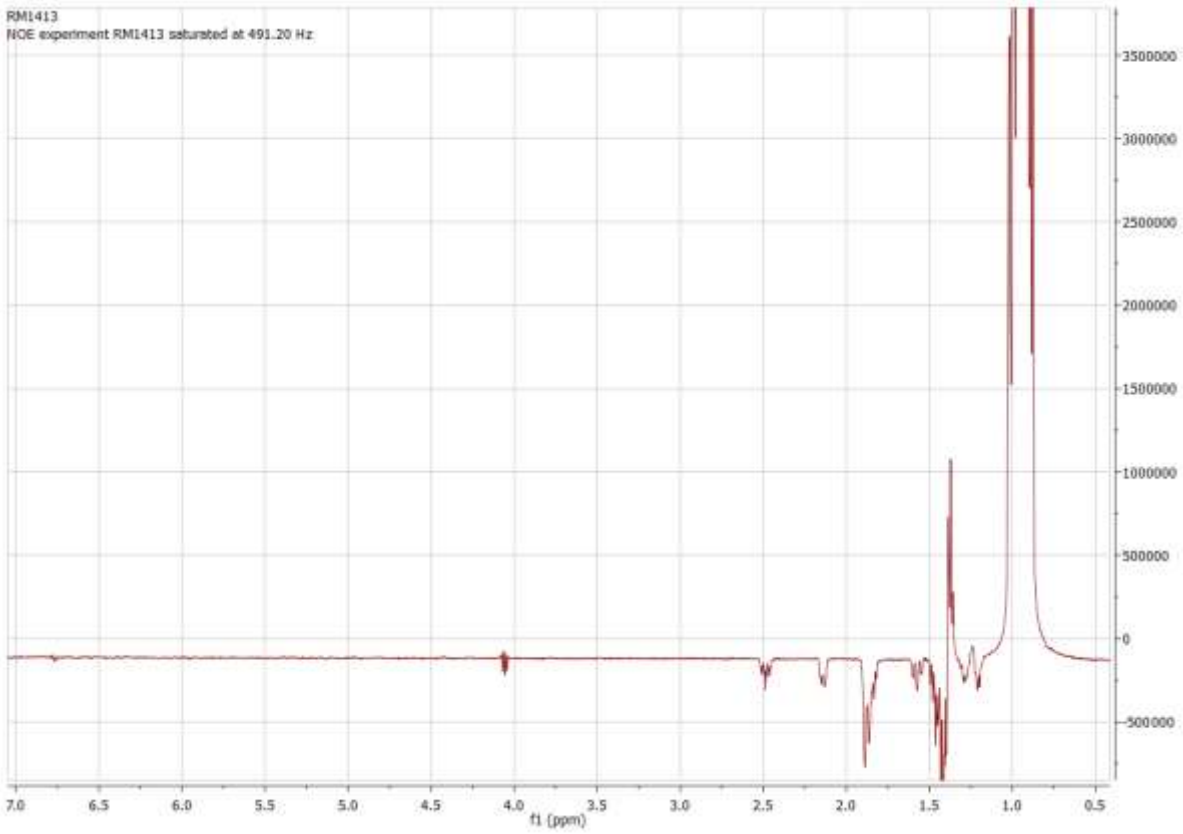


Figure SI3: ^{1}H 1D NOESY NMR spectrum of compound **29** saturated at 491.20 Hz, 0.98 ppm. The large number of signals results from the saturation of both of the CH_3 environments (0.95 and 0.90 ppm respectively) in the molecule and thus a large number of NOE enhancements result.

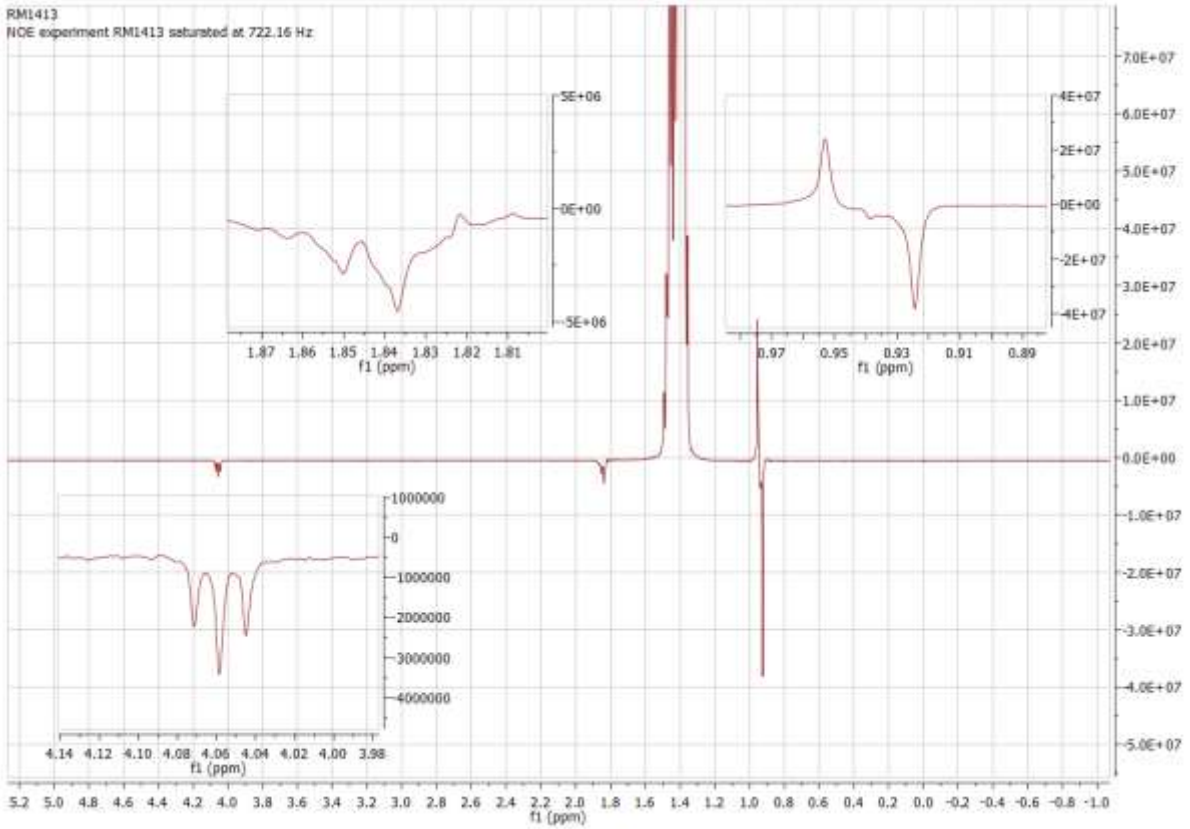


Figure SI4: ^{1}H 1D NOESY NMR spectrum of compound **29** saturated at 722.16 Hz, 1.44 ppm.

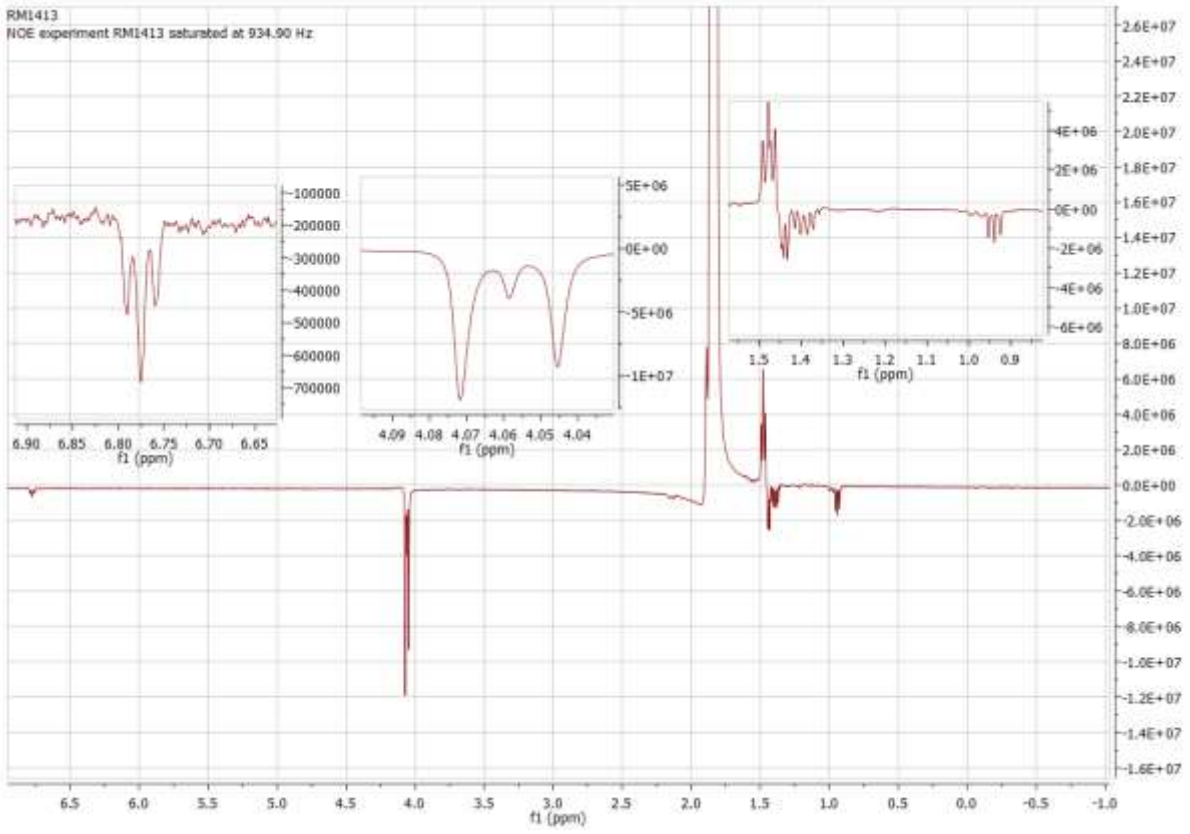


Figure SI5: ^{1}H 1D NOESY NMR spectrum of compound **29** saturated at 934.90 Hz, 1.87 ppm.

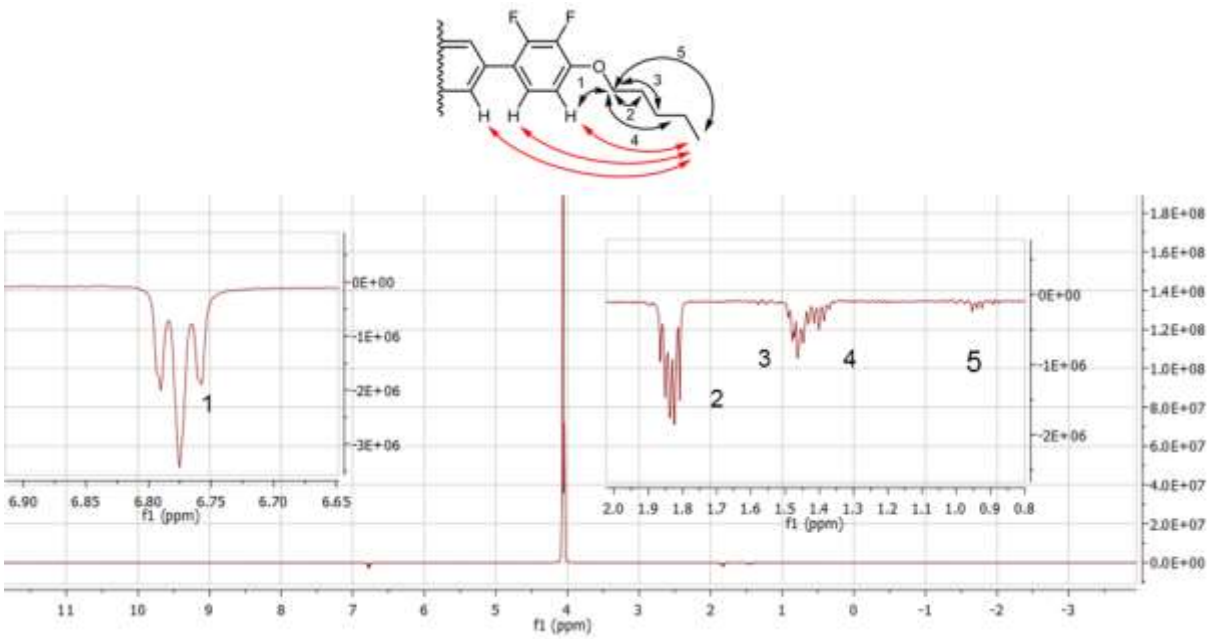


Figure SI6: ^{1}H 1D NOESY NMR spectrum of compound **29** saturated at 4.08 ppm (2051.92 Hz), this frequency corresponds to the ArOCH_2 environment. The numbered black arrows indicate the assigned NOE enhancements, whereas red arrows indicate unobserved NOE enhancements.

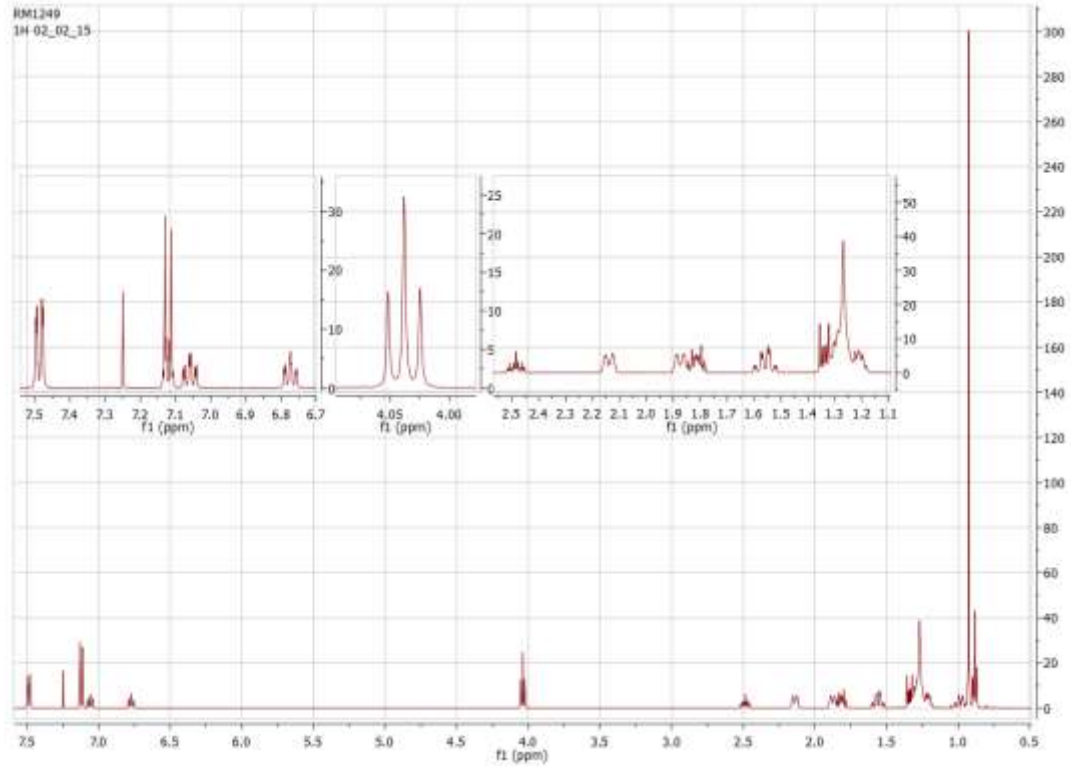


Figure SI7: ^{1}H NMR spectrum of compound **30**, unsaturated.

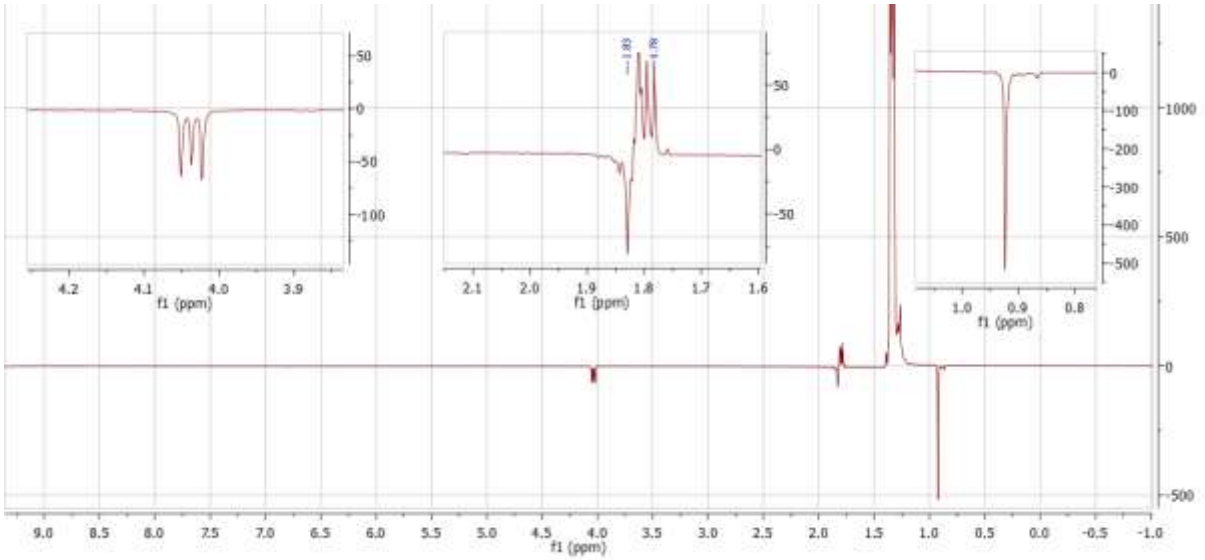


Figure SI8: ^{1}H 1D NOESY NMR spectrum of compound **30** saturated at 1.34 ppm.

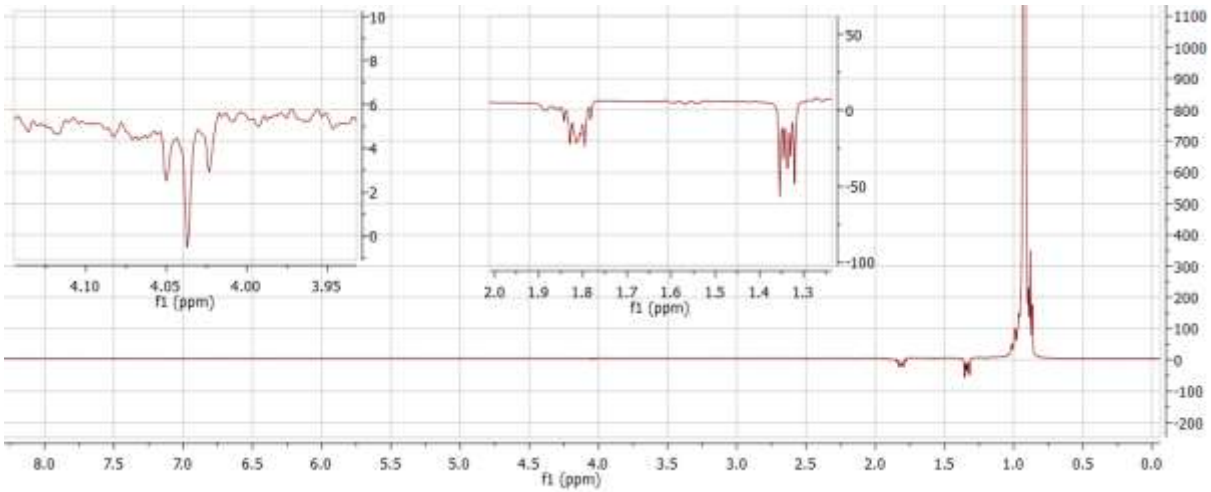


Figure SI9: ^{1}H 1D NOESY NMR spectrum of compound **30** saturated at 0.93 ppm.

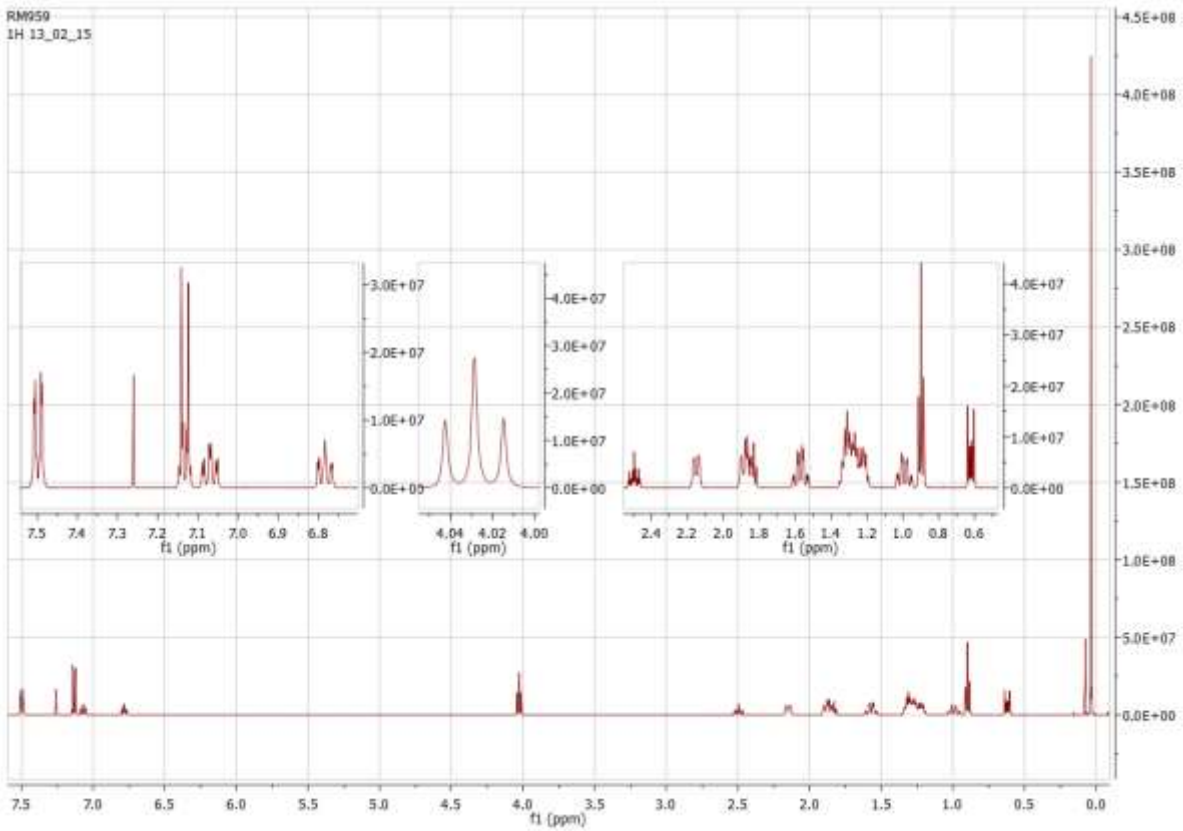


Figure SI10: ^{1}H NMR spectrum of compound **31**, unsaturated.

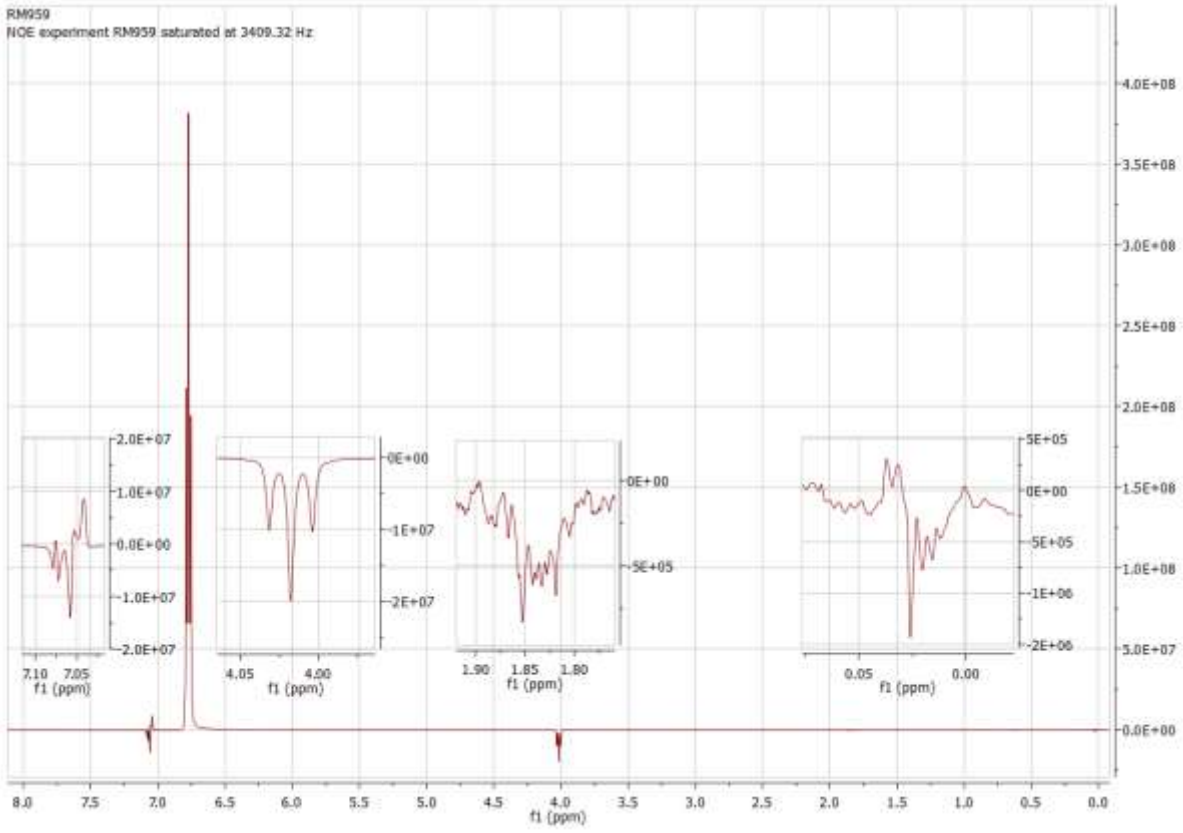


Figure SI11: ^{1}H NMR spectrum of compound **31** saturated at 3409.32 Hz, 6.81 ppm

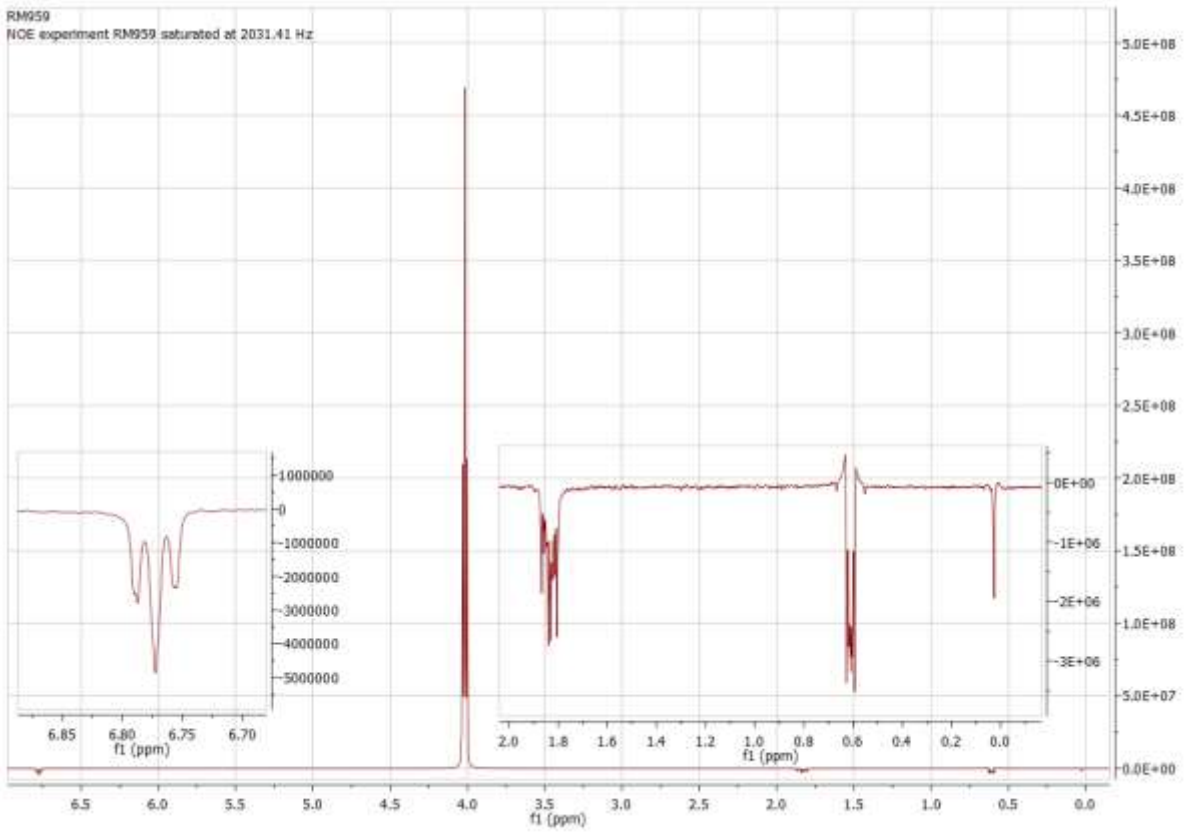


Figure SI12: ^{1}H NMR spectrum of compound **31** saturated at 2031.41 Hz, 4.06 ppm

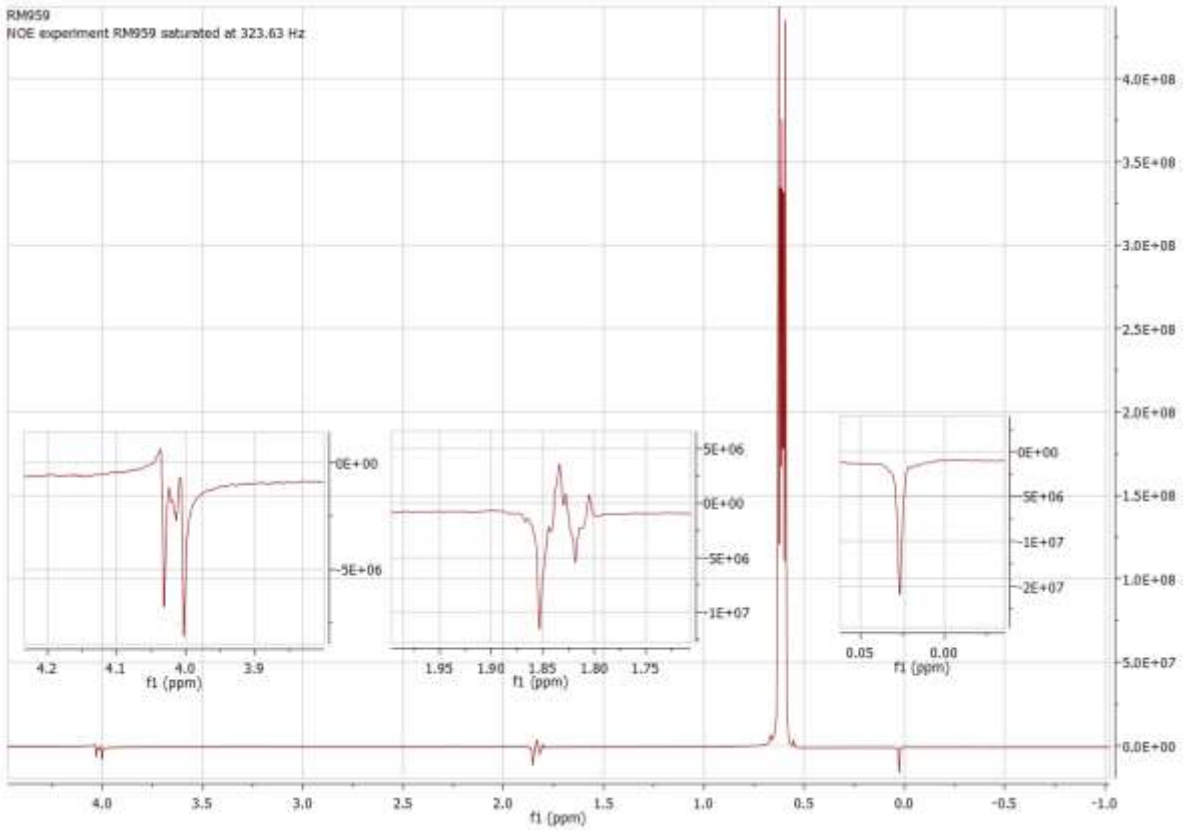


Figure SI13: ^{1}H 1D NOESY NMR spectrum of compound **31** saturated at 323.63 Hz, 0.64 ppm

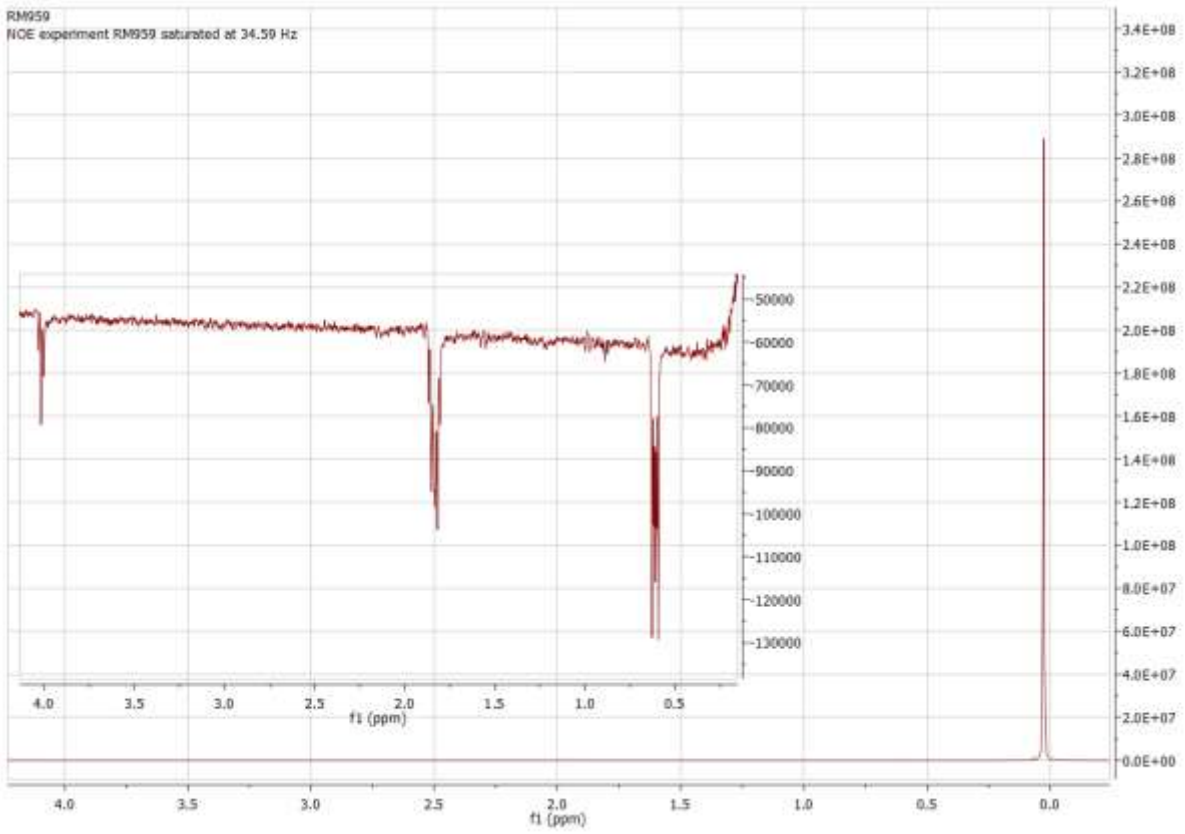


Figure SI14: [1]H 1D NOESY NMR spectrum of compound **31** saturated at 34.59 Hz, 0.07 ppm

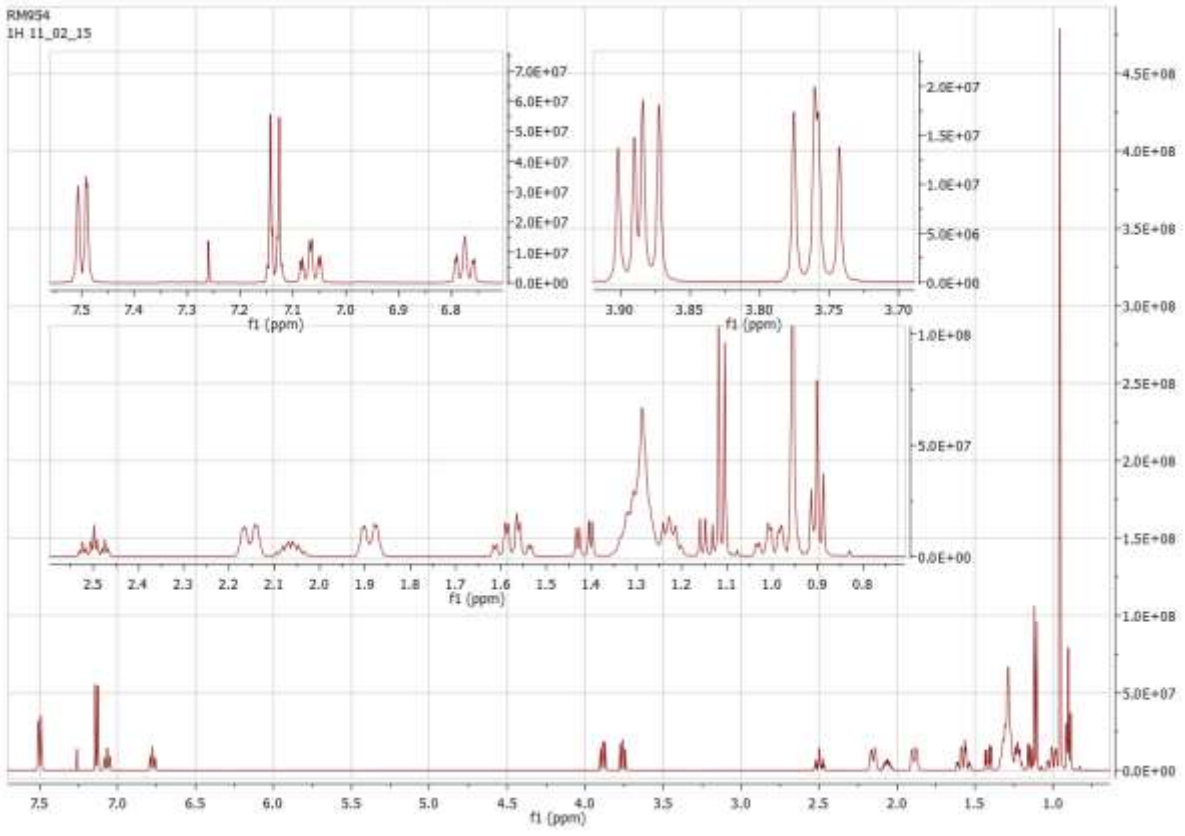


Figure SI15: [1]H NMR spectrum of compound **32**, unsaturated.

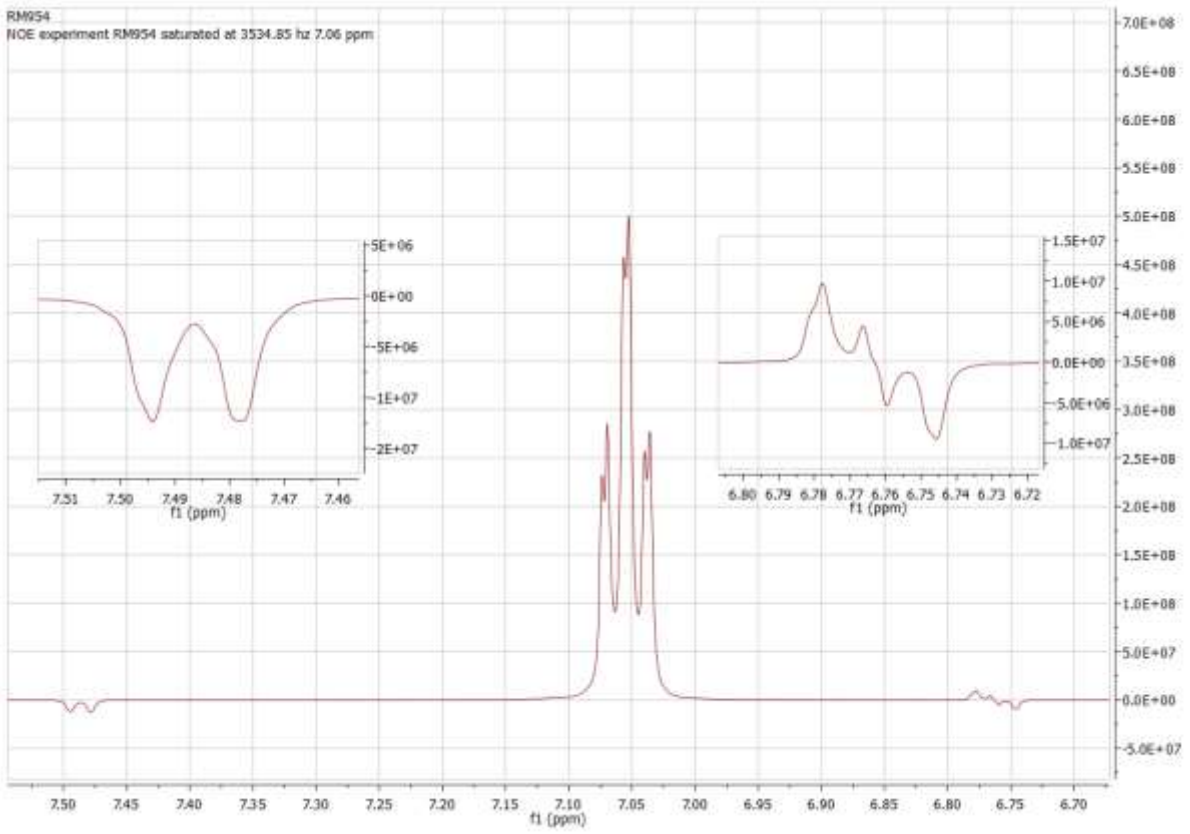


Figure SI16: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 3534.85 Hz, 7.06 ppm.

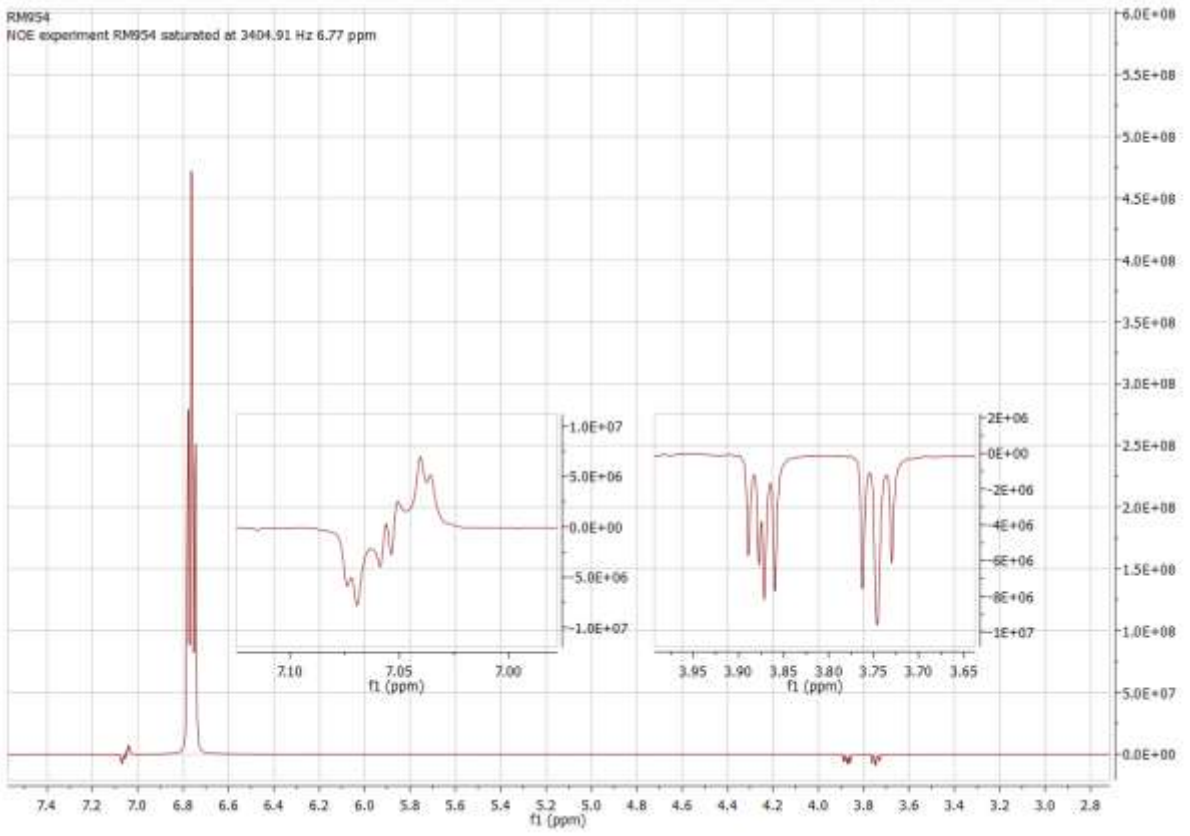


Figure SI17: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 3404.91 Hz, 6.77 ppm.

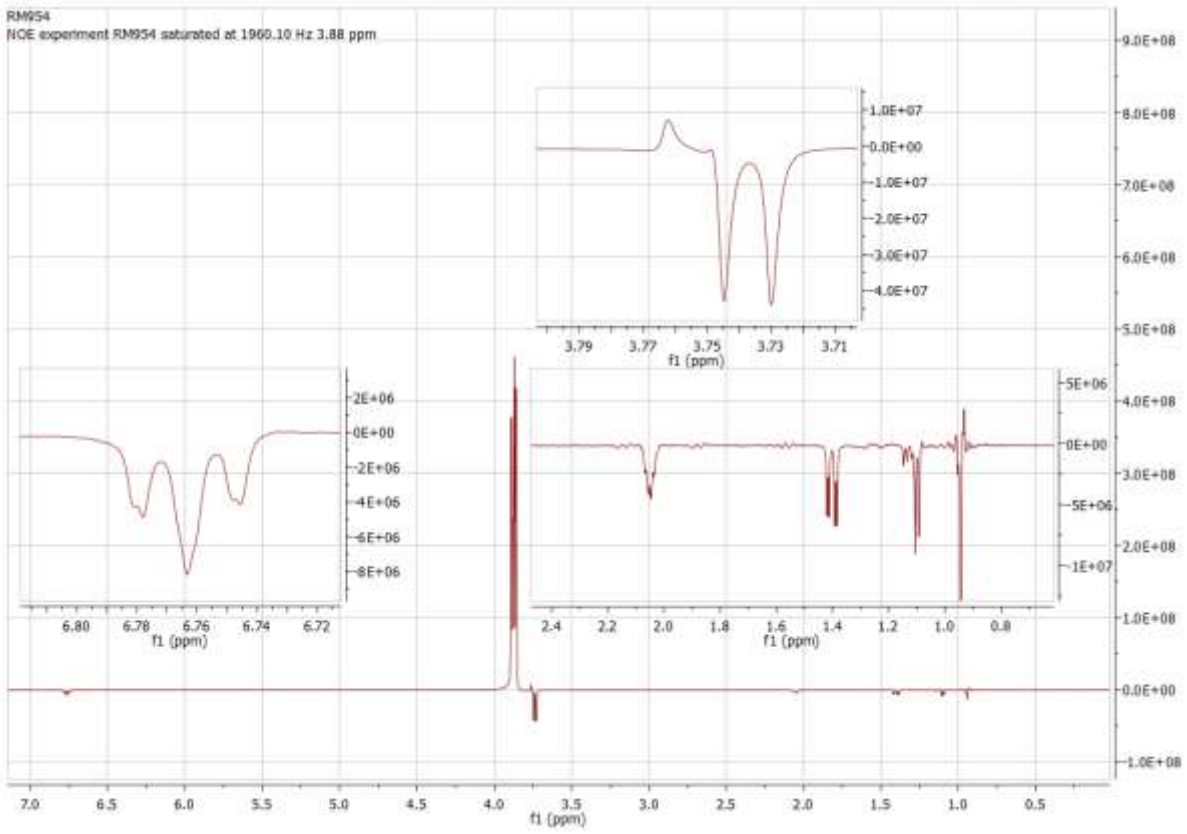


Figure SI18: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 1960.10 Hz, 3.88 ppm.

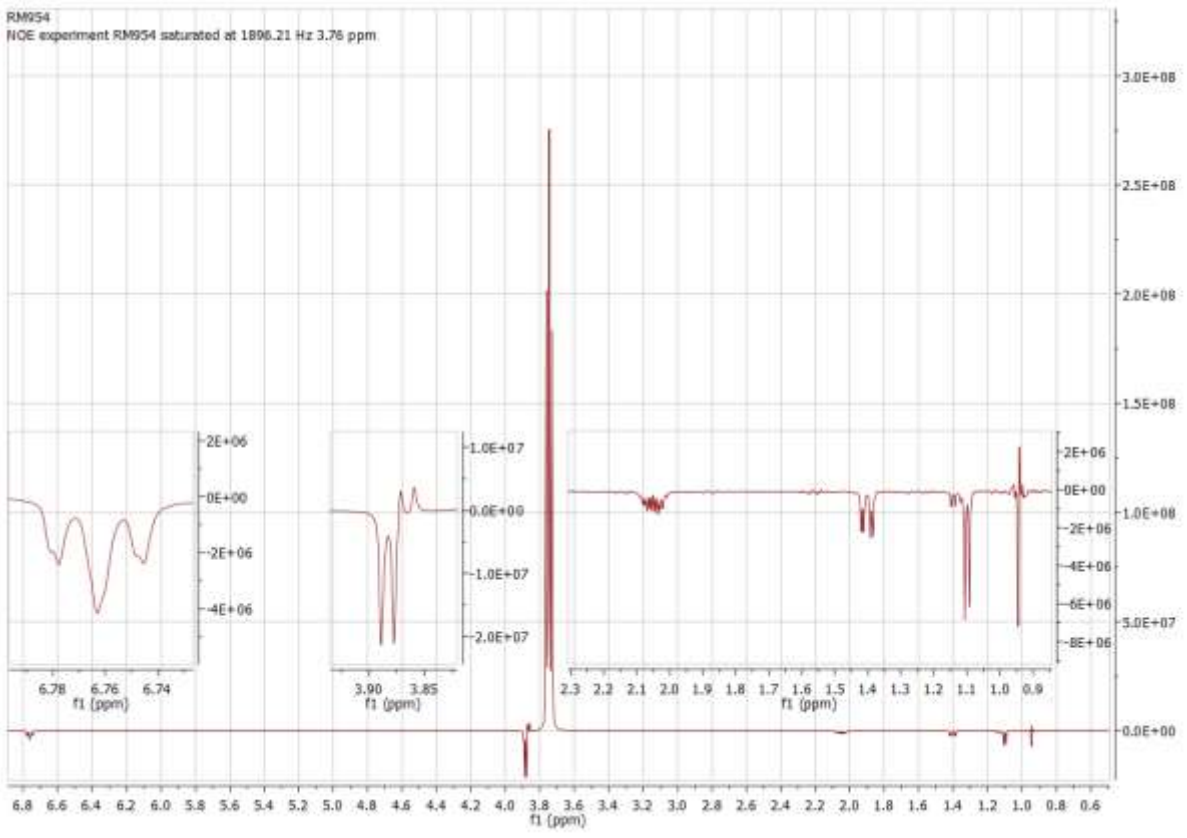


Figure SI19: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 1896.21 Hz, 3.76 ppm.

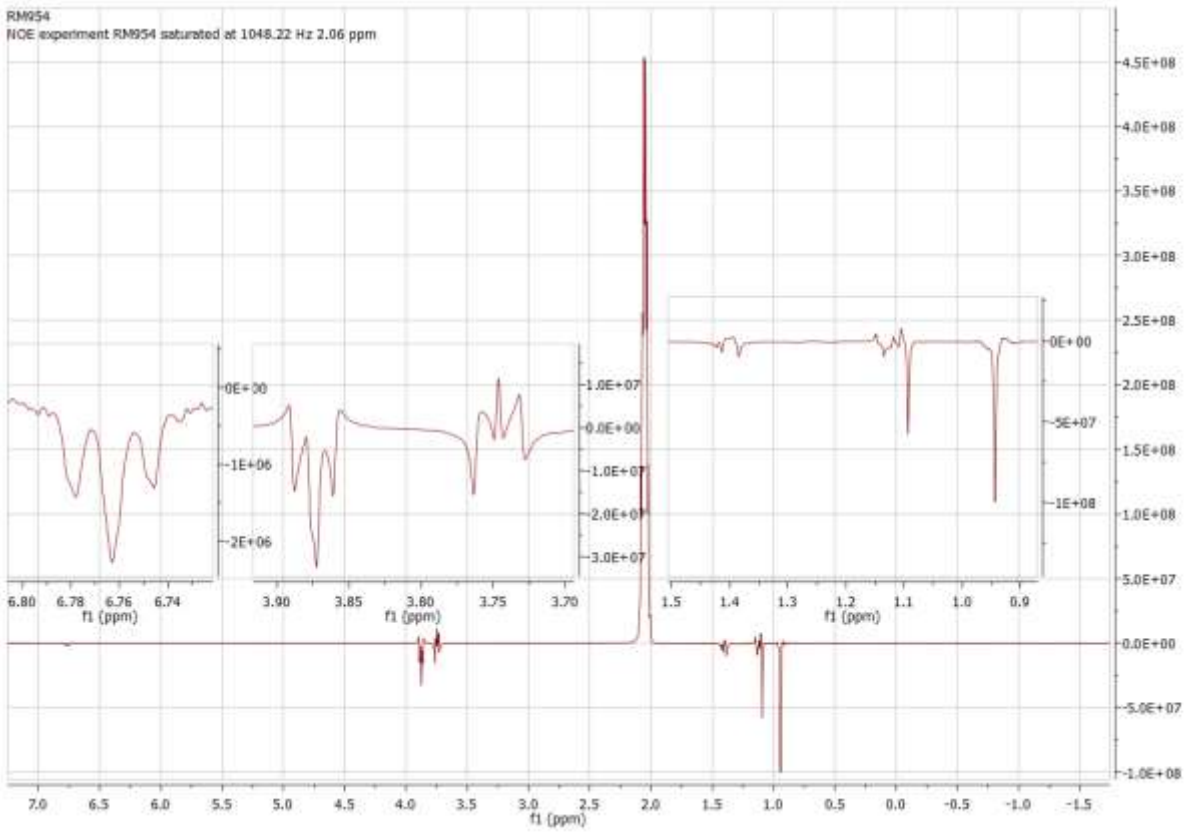


Figure SI20: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 1048.22 Hz, 2.06 ppm.

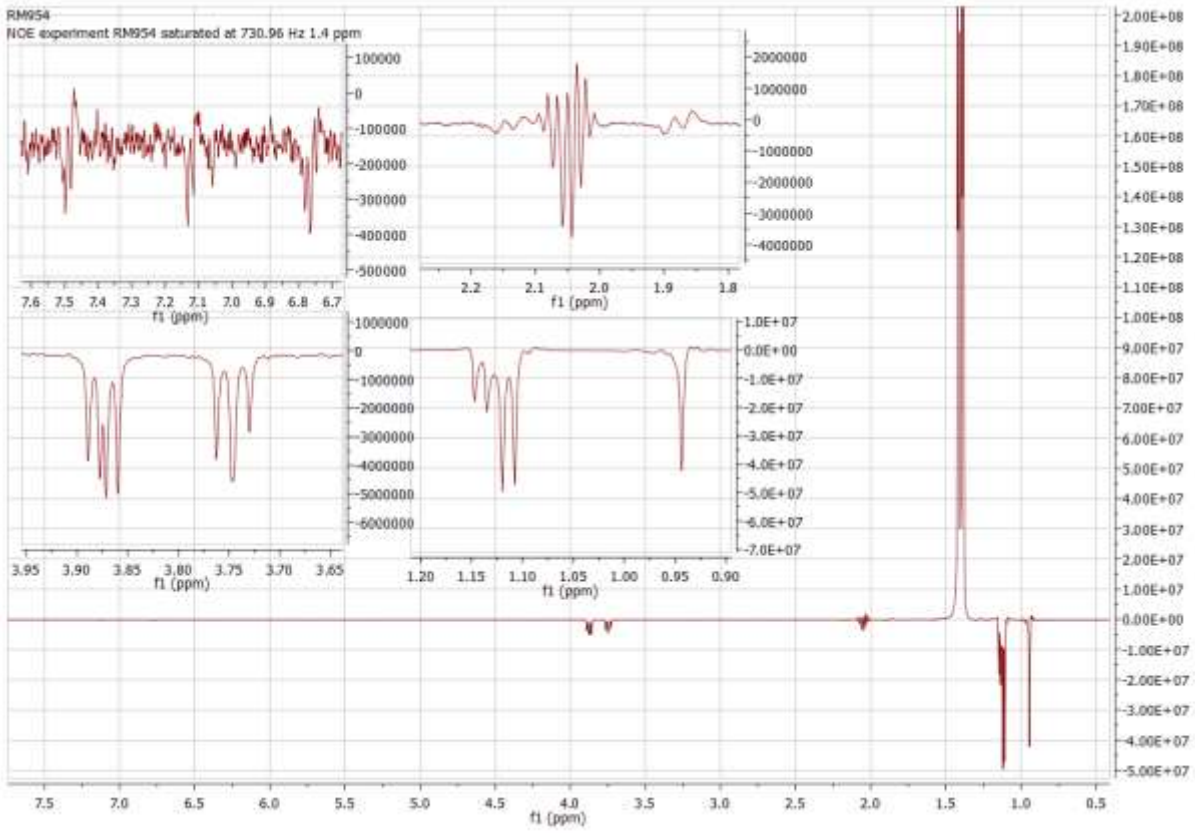


Figure SI21: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 730.96 Hz, 1.41 ppm.

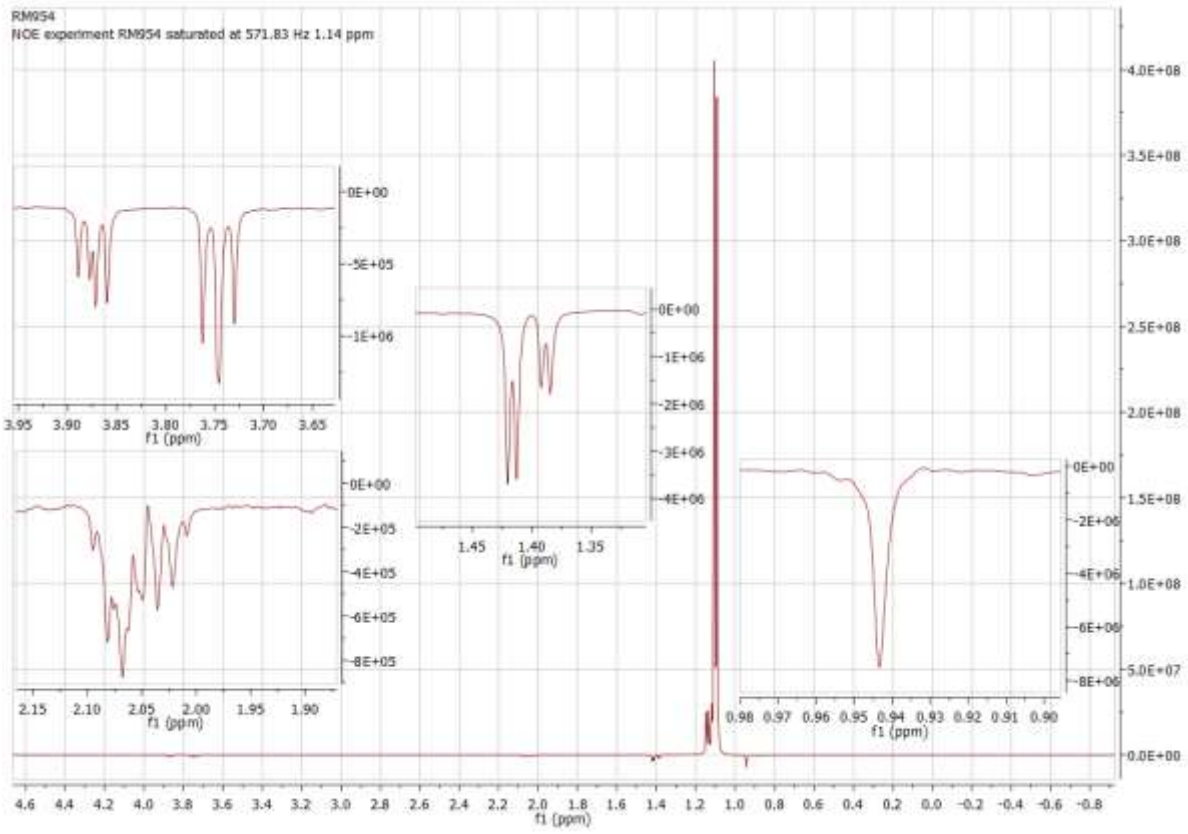


Figure SI22: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 571.83 Hz, 1.14 ppm.

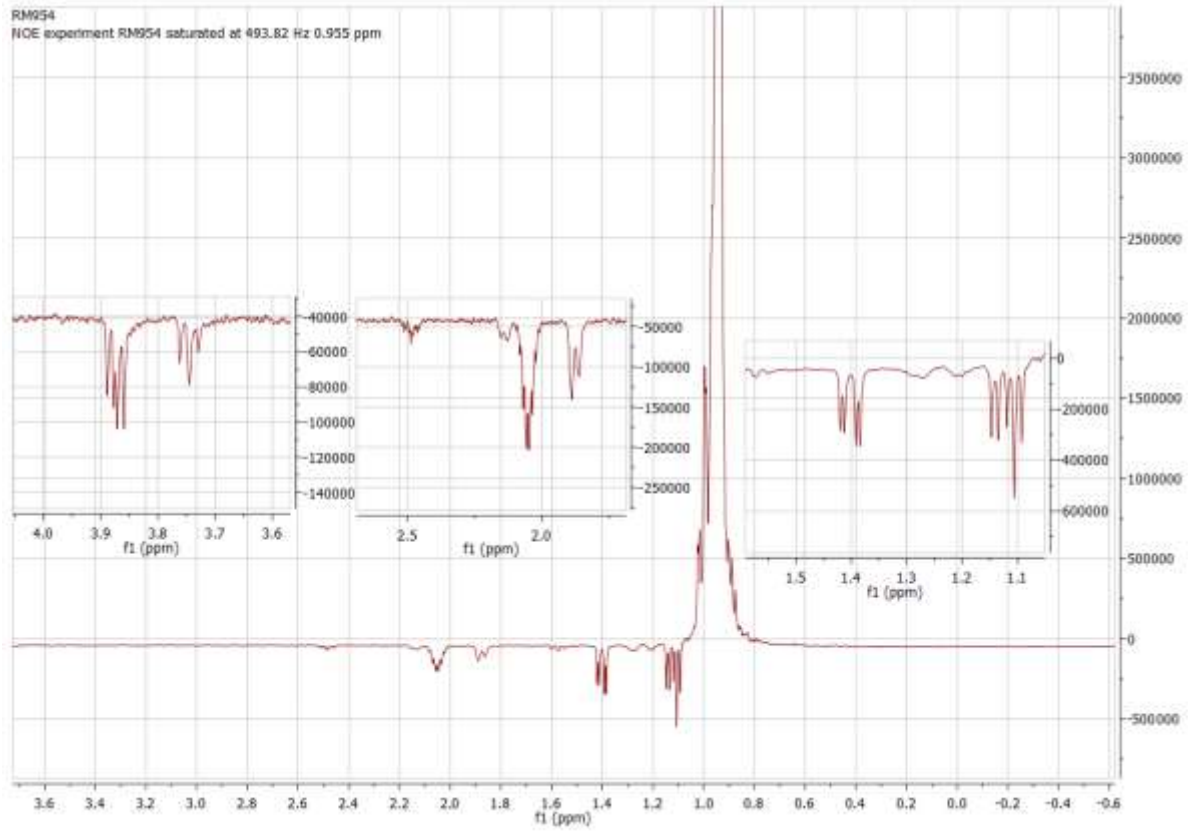


Figure SI23: ^{1}H 1D NOESY NMR spectrum of compound **32** saturated at 493.82 Hz, 0.955 ppm.

Supplemental DSC data

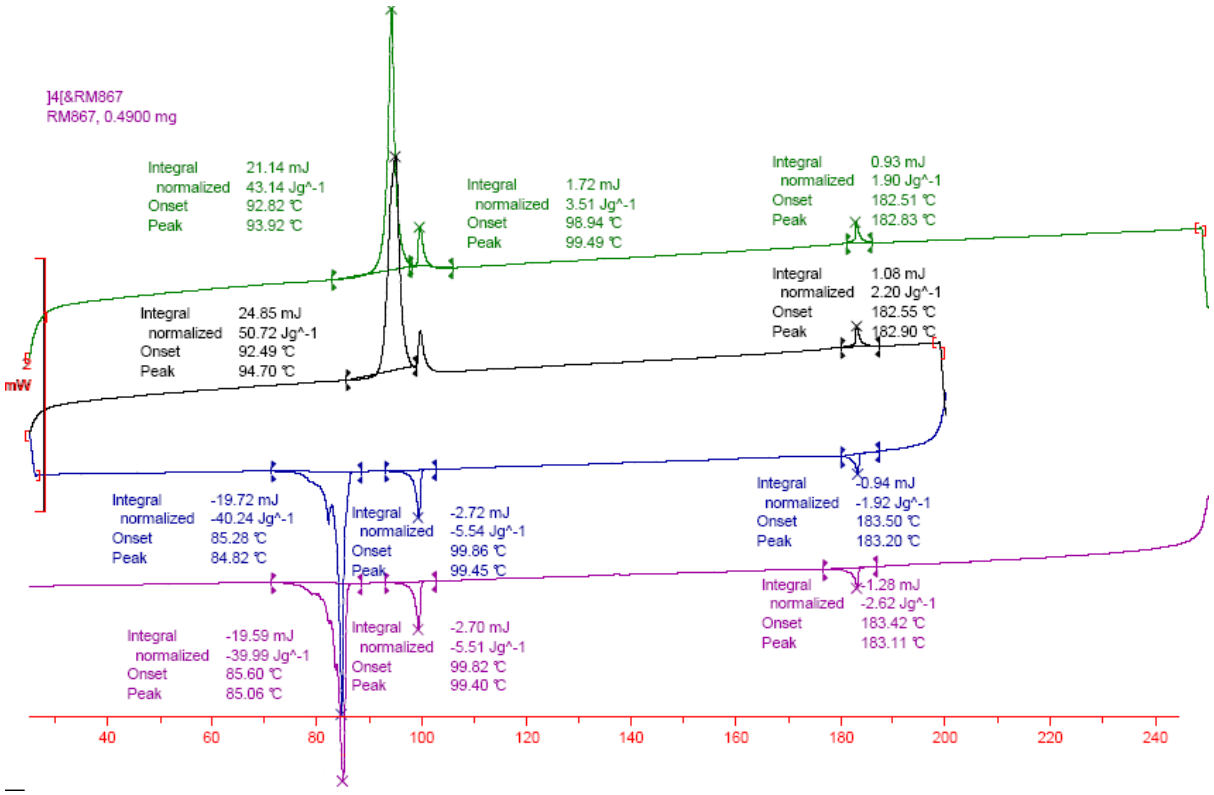


Figure SI24: DSC trace (10°C min $^{-1}$) for compound **16**.

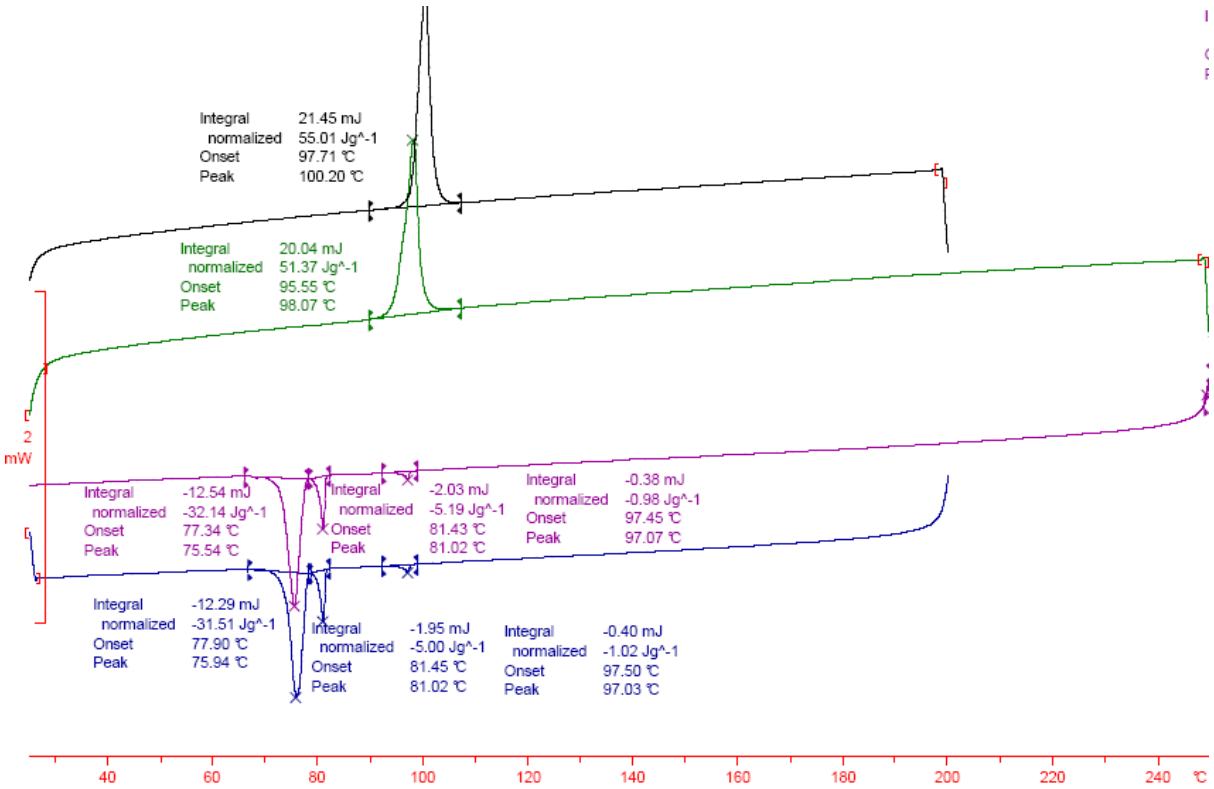


Figure SI25: DSC trace (10°C min $^{-1}$) for compound **17**.

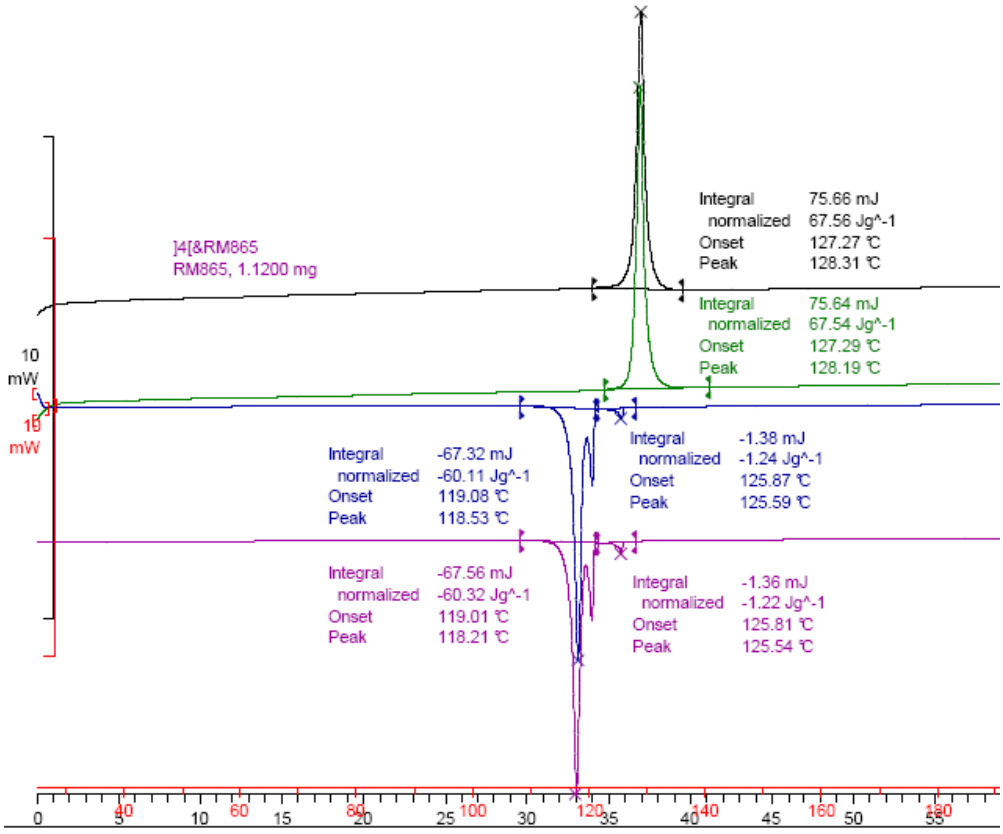


Figure SI26: DSC trace (10°C min $^{-1}$) for compound **18**.

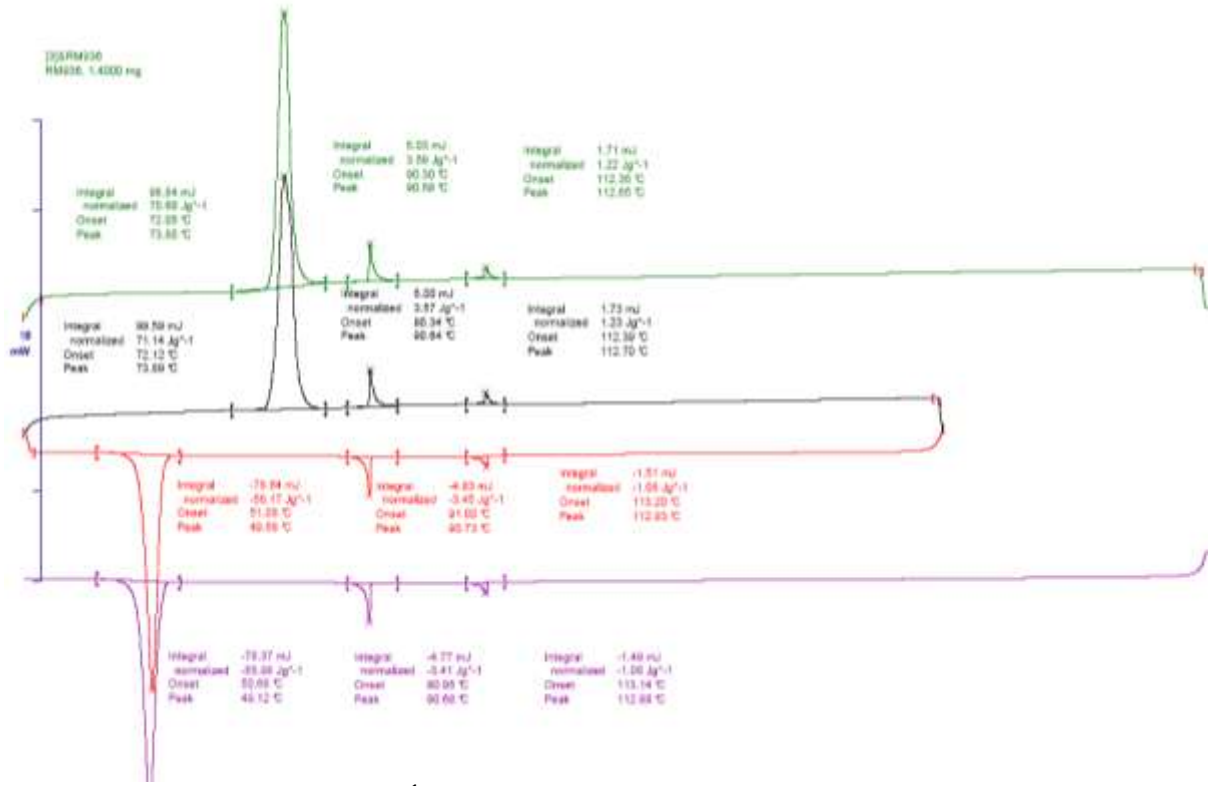


Figure SI27: DSC trace (10°C min $^{-1}$) for compound **19**.

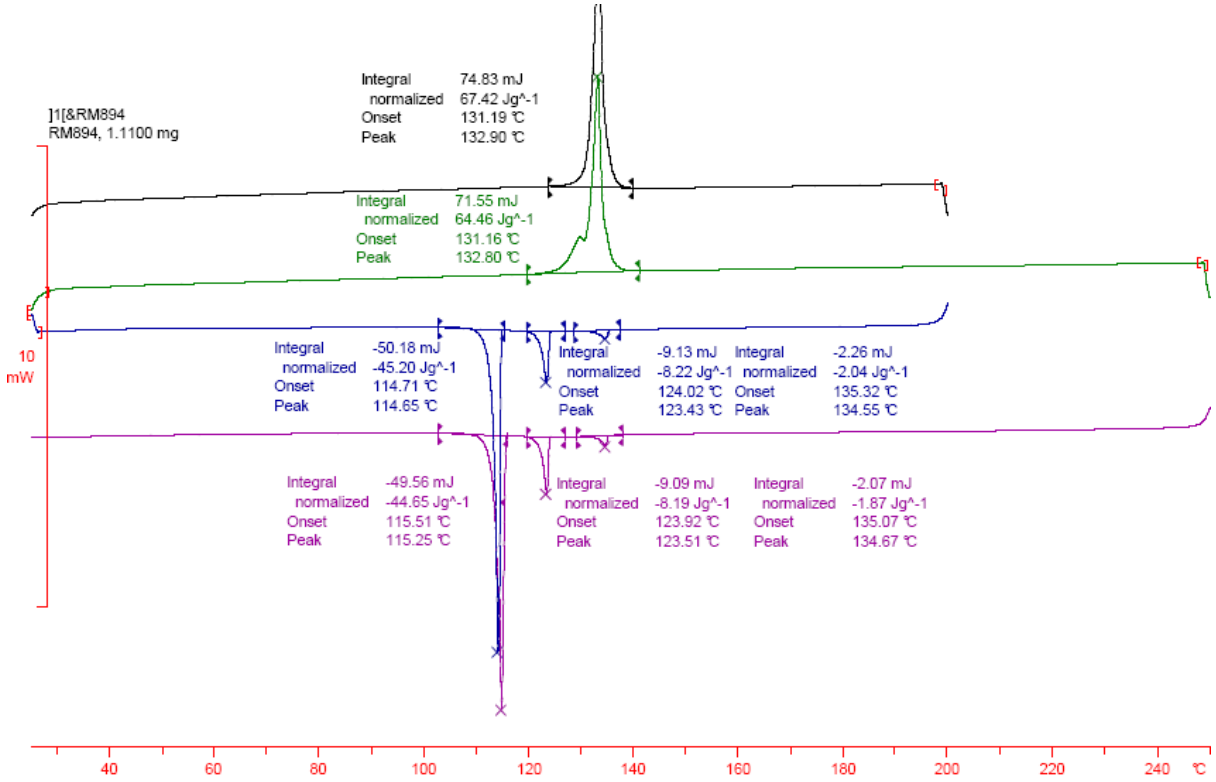


Figure SI28: DSC trace (10°C min $^{-1}$) for compound **20**.

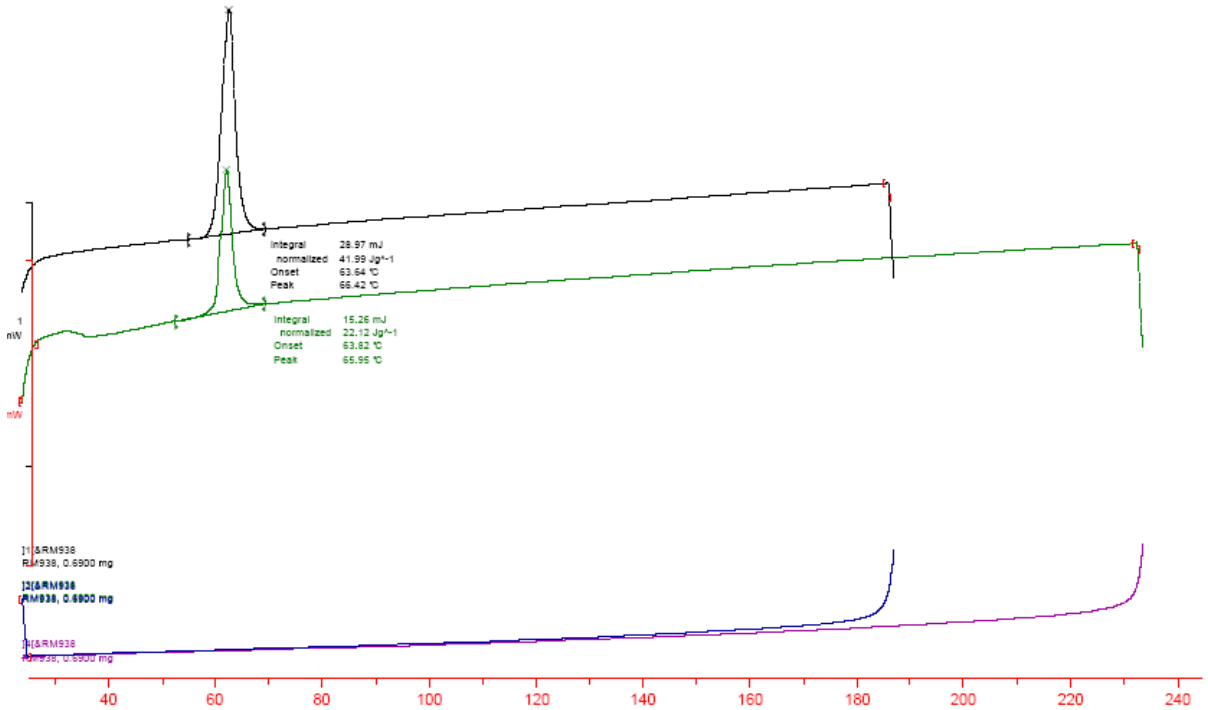


Figure SI29: DSC trace (10°C min $^{-1}$) for compound **21**.

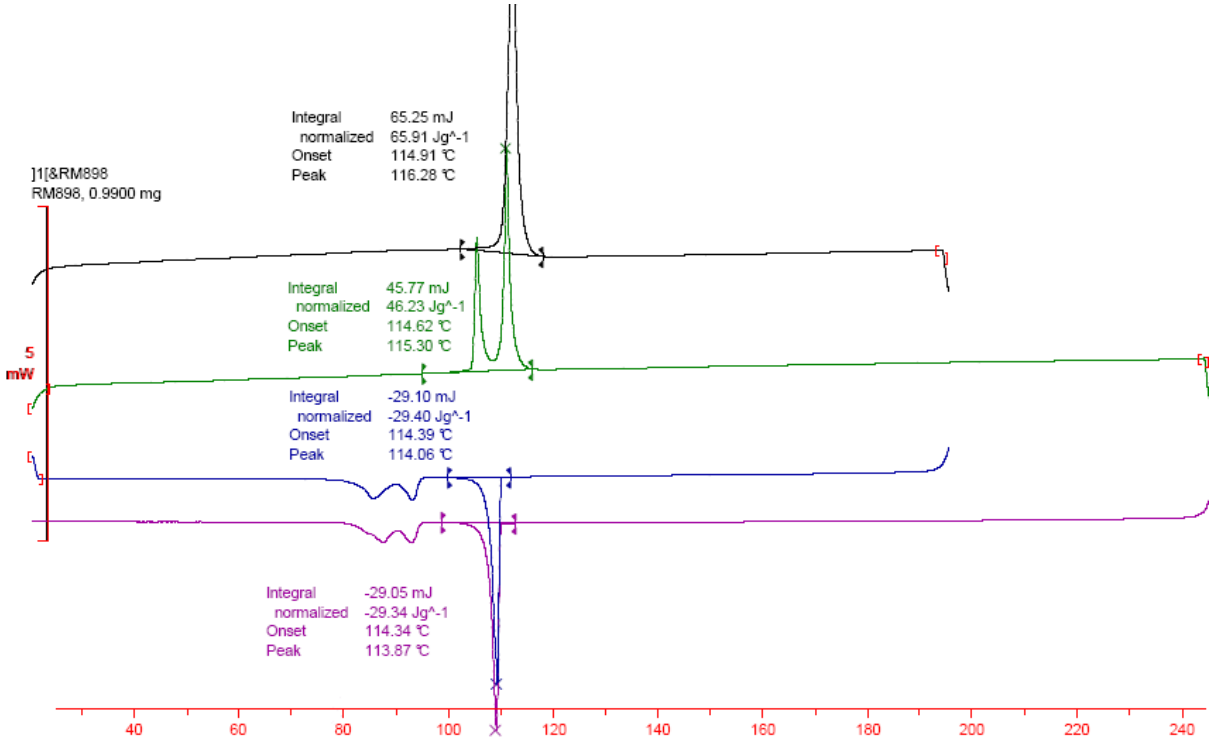


Figure SI30: DSC trace (10°C min $^{-1}$) for compound **22**.

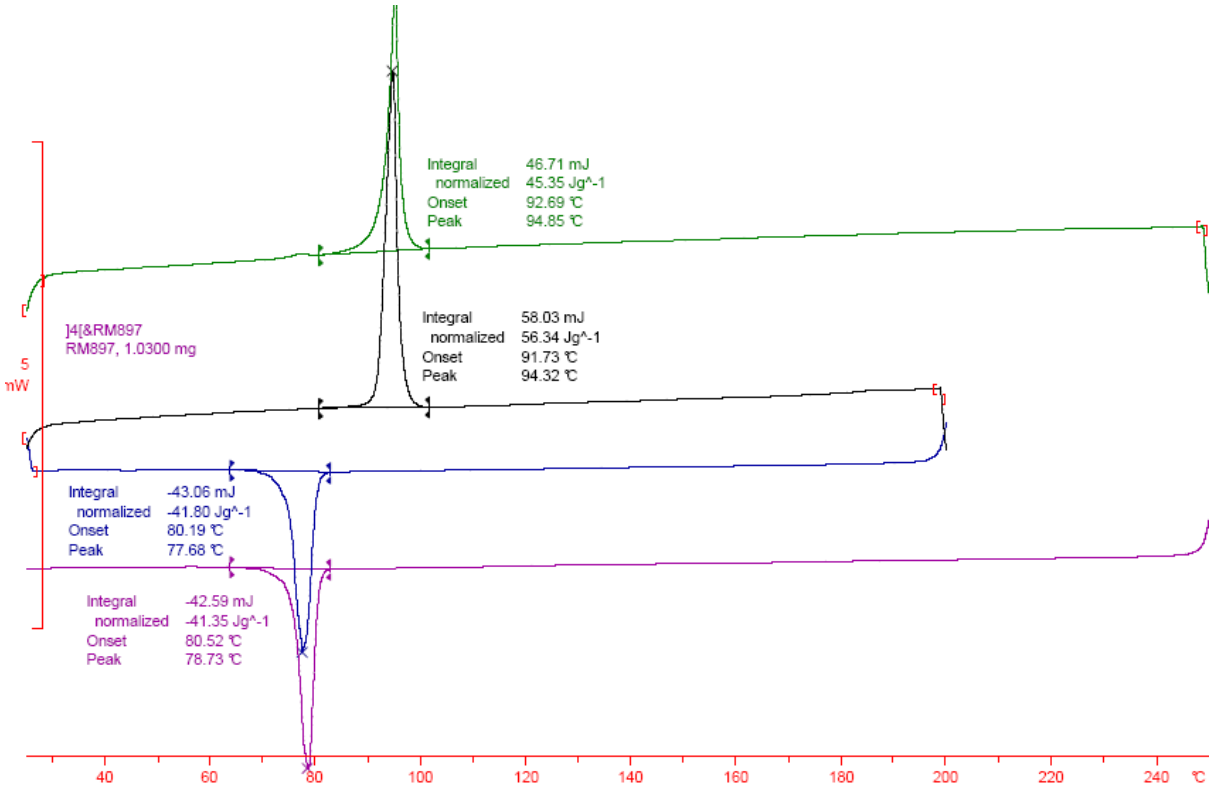


Figure SI31: DSC trace (10°C min $^{-1}$) for compound **23**.

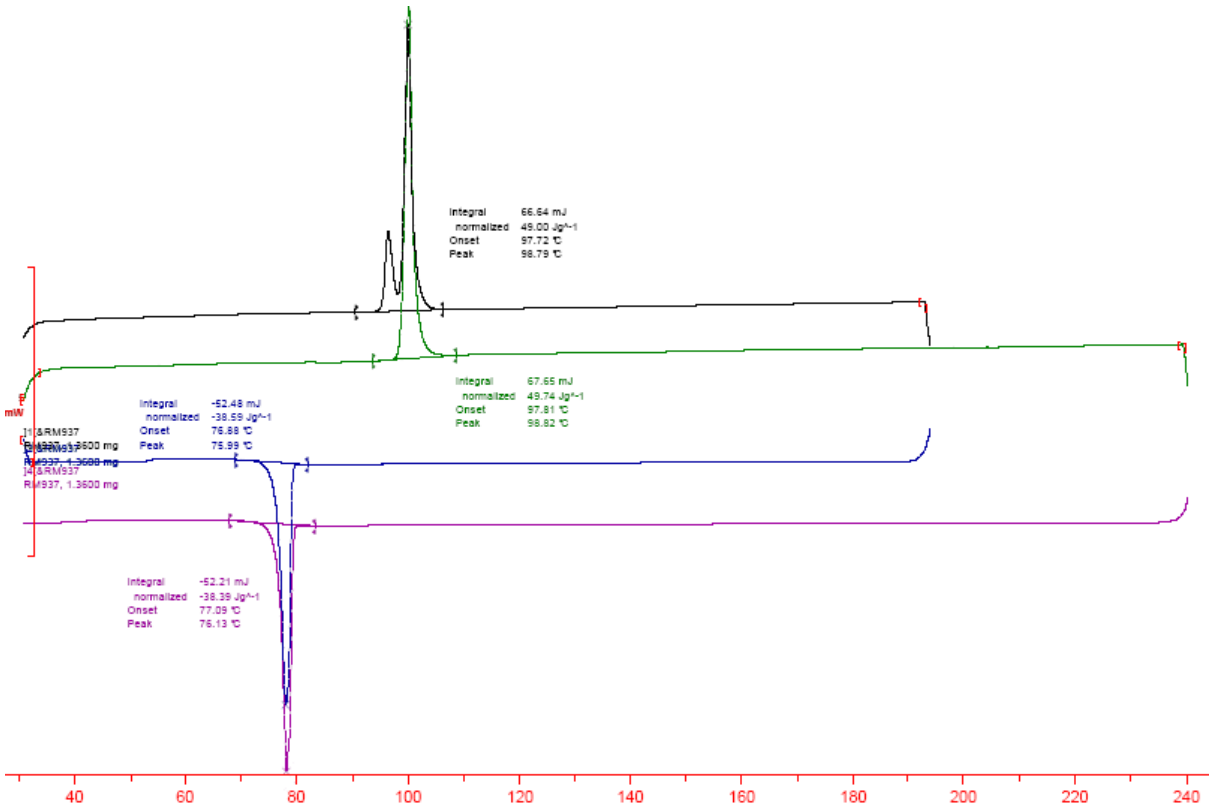


Figure SI32: DSC trace (10°C min $^{-1}$) for compound **24**.

Supplementary Information References

SI1. H. Kessler, H. Oschkinat, C. Griesinger and W. Bermel, *J. Magn. Reson.,* **1986**, *70*, 106

SI2. J. Stonehouse, P. Adell, J. Keeler and A.J. Shaka, *JACS*, **1994**, *116*, 6037

SI3. K. Stott, J. Stonehouse, J. Keeler, T.L. Hwang and A.J. Shaka, *JACS*, **1995**, *117*, 4199-4200

SI4. Gaussian 09, Revision D.01, M. J. Frisch, G. W. Trucks, H. B. Schlegel, G. E. Scuseria, M. A. Robb, J. R. Cheeseman, G. Scalmani, V. Barone, B. Mennucci, G. A. Petersson, H. Nakatsuji, M. Caricato, X. Li, H. P. Hratchian, A. F. Izmaylov, J. Bloino, G. Zheng, J. L. Sonnenberg, M. Hada, M. Ehara, K. Toyota, R. Fukuda, J. Hasegawa, M. Ishida, T. Nakajima, Y. Honda, O. Kitao, H. Nakai, T. Vreven, J. A. Montgomery, Jr., J. E. Peralta, F. Ogliaro, M. Bearpark, J. J. Heyd, E. Brothers, K. N. Kudin, V. N. Staroverov, R. Kobayashi, J. Normand, K. Raghavachari, A. Rendell, J. C. Burant, S. S. Iyengar, J. Tomasi, M. Cossi, N. Rega, J. M. Millam, M. Klene, J. E. Knox, J. B. Cross, V. Bakken, C. Adamo, J. Jaramillo, R. Gomperts, R. E. Stratmann, O. Yazyev, A. J. Austin, R. Cammi, C. Pomelli, J. W. Ochterski, R. L. Martin, K. Morokuma, V. G. Zakrzewski, G. A. Voth, P. Salvador, J. J. Dannenberg, S. Dapprich, A. D. Daniels, Ö. Farkas, J. B. Foresman, J. V. Ortiz, J. Cioslowski, and D. J. Fox, Gaussian, Inc., Wallingford CT, **2009**.