Supporting Information

for

Total syntheses of certain asperversiamides, linearly-fused and prenylated indole alkaloids

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(i) General Expermental Protocols

Unless otherwise specified, proton (^{1}H) and carbon (^{13}C{^{1}H}) NMR spectra were recorded at room temperature in $CDCl_3$, $(CD_3)_2SO$ or CD_3OD on spectrometers operating at 300, 500 or 600 MHz for proton and 75, 126 and 151 MHz for carbon nuclei. For ^{1}H NMR spectra, signals arising from the residual protioforms of the solvent were used as the internal standards. ^{1}H NMR data are recorded as follows: chemical shift (δ) [multiplicity, coupling constant(s) *J* (Hz), relative integral] where multiplicity is defined as: s = singlet; d = doublet; t = triplet; q = quartet; m = multiplet or combinations of the above. The signal due to residual $CHCl_3$ appearing at δ_H 7.26 and the central resonance of the $CDCl_3$ "triplet" appearing at δ_C 77.0 were used to reference ^{1}H and ^{13}C NMR spectra, respectively. In the case of those spectra recorded in CD_3OD the ^{1}H and ^{13}C chemical shifts were referenced to the residual solvent peaks appearing at δ_H 3.31 and δ_C 49.0, respectively. Infrared spectra were recorded, as thin films or solids, on a Nicolet iS50 FT-IR spectrometer fitted with a Smart iTX sampling module. High-resolution ESI mass spectra were recorded on a time-of-flight instrument. Melting points were measured on an automated melting point system and are uncorrected. Analytical thin layer chromatography (TLC) was performed on glass-backed silica gel 60 F_{254} plates. Eluted plates were visualized using a 254 nm UV lamp and/or by treatment with a suitable dip followed by heating. These dips included phosphomolybdic acid: ceric sulfate : sulfuric acid (conc.) : water (37.5 g : 7.5 g : 37.5 g : 720 mL) or potassium permanganate : potassium carbonate : 5% sodium hydroxide aqueous solution : water (3 g : 20 g: 5 mL : 300 mL). Flash chromatographic separations were carried out following protocols defined by Still *et al*.[1] with silica gel 60 (40–63 μm) as the stationary phase and using the AR- or HPLC-grade solvents indicated. Petroleum ether refers to the fraction boiling between 40 and 60 °C. Starting materials, reagents and drying agents as well as other inorganic salts were generally available from commercial sources and used as supplied. Where necessary, reactions were performed under a nitrogen or argon atmosphere.

Electrochemical formylation reactions were conducted using an AXIOMET AX-3003P potentiostat operating under air and in constant-current mode using an undivided cell equipped with a graphite plate (1.0 cm × 1.0 cm × 0.2 cm) as the anode and a platinum plate (1.0 cm × 1.0 cm × 0.01 cm) as the cathode (**Figure S1**). Graphite plates were purchased from Bei Jing Jinglong Special Carbon Technology Co. Ltd (China) while the platinum electrodes are purchased from Tian Jin Aida Co. Ltd (China).

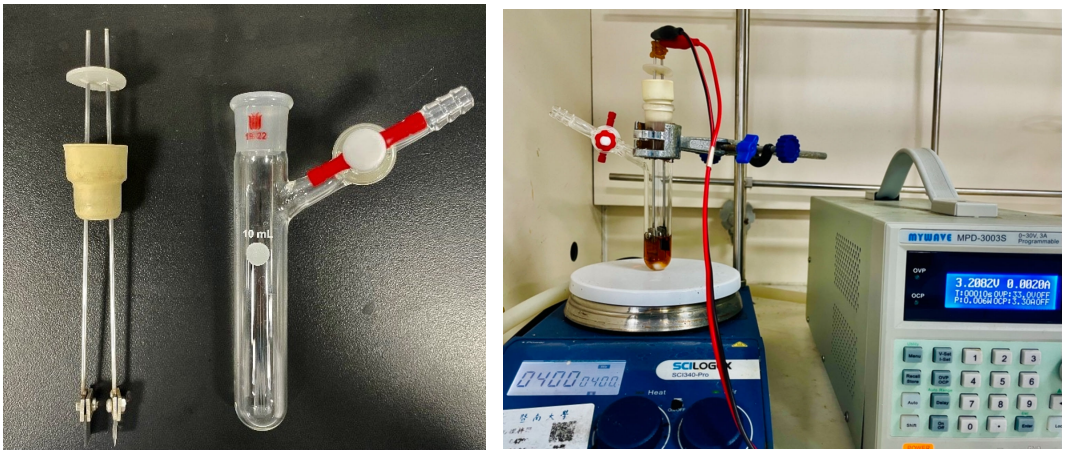
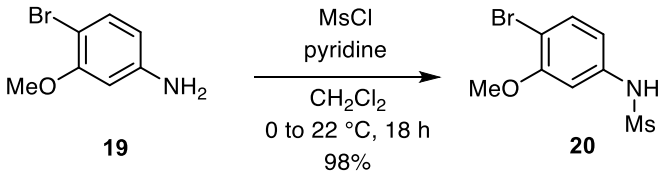


Figure S1. Apparatus used in the electrochemical formylation reactions.

(ii) Specific Chemical Transformations

Part A. Synthesis of Asperversiamide J (10)



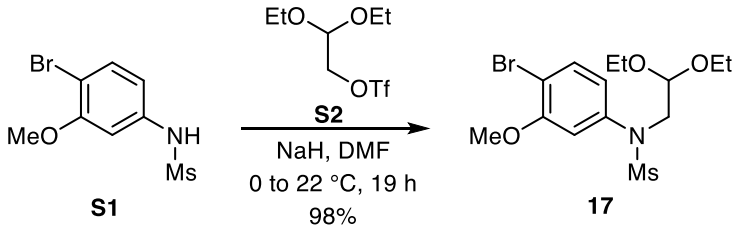
***N*-(4-Bromo-3-methoxyphenyl)methanesulfonamide (20).** A magnetically stirred and chilled (ice-water bath) solution of aniline **19** (20.2 g, 100 mmol, 1.0 equiv.) and pyridine (8.09 mL, 100 mmol, 1.0 equiv.) in dichloromethane (200 mL) maintained under a nitrogen atmosphere was slowly treated with methanesulfonyl chloride (8.05 mL, 104 mmol, 1.04 equiv.). The ensuing mixture was then warmed to 22 °C, stirred at this temperature for 18 h and then diluted with dichloromethane (400 mL). The combined organic phases were then washed with distilled water (2 × 100 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure to give the title compound **20** (27.4 g, 98 %) as a brown solid, R_f = 0.5 (silica, 2:3 v/v petroleum ether/ethyl acetate elution), m.p. = 123.0–124.5 °C.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.49 (d, J = 8.5 Hz, 1H), 7.31 (s, 1H), 6.89 (d, J = 2.4 Hz, 1H), 6.73 (dd, J = 8.5 and 2.4 Hz, 1H), 3.90 (s, 3H), 3.05 (s, 3H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 156.7, 137.3, 133.9, 113.5, 107.9, 104.9, 56.4, 39.2.

IR ν_{max} 3065, 2930, 1593, 1489, 1321, 1150, 1050, 977, 764 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_8H_{11}{}^{79}BrNO_3S$ 279.9643, found 279.9642.



***N*-(4-Bromo-3-methoxyphenyl)-N-(2,2-diethoxyethyl)methanesulfonamide (17).** A magnetically stirred and chilled (ice-water bath) suspension of NaH (60 % dispersion in mineral oil, 5.1 g, 127 mmol, 1.3 equiv.) in DMF (35.0 mL) maintained under a nitrogen atmosphere was treated, over 0.5 h, with a solution of compound **S1** (27.4 g, 98.0 mmol, 1.0 equiv.) in DMF (100.0 mL). After evolution of dihydrogen gas had ceased, 2,2-diethoxyethyl trifluoromethanesulfonate **S2** (31.3 g, 118 mmol, 1.2 equiv.) was added in

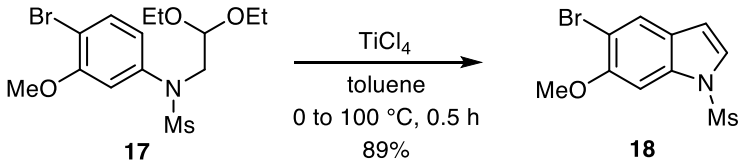
one portion and the resulting solution warmed to 22 °C and stirred at this temperature for 6 h. Additional quantities of NaH (60 % dispersion in oil, 1.18 g, 29.4 mmol, 0.3 equiv.) and compound **S2** (5.22 g, 19.6 mmol, 0.2 equiv) were then added and stirring was continued for a further 13 h. The reaction mixture was then quenched with water (200 mL) (CAUTION: possiblity of hydrogen gas evolution) and extracted with ethyl acetate (3 × 200 mL). The combined organic phases were then washed with distilled water (1 × 200 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 10:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **17** (38.1 g, 98%) as a brown solid, m.p. = 70–71 ºC.

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.61 (d, J = 8.4 Hz, 1H), 7.11 (d, J = 2.4 Hz, 1H), 6.94 (dd, J = 8.4 and 2.4 Hz, 1H), 4.48 (t, J = 5.5 Hz, 1H), 3.87 (s, 3H), 3.71 (d, J = 5.5 Hz, 2H), 3.58-3.51 (complex m, 2H), 3.46-3.41 (complex m, 2H), 3.06 (s, 3H), 1.05 (t, J = 7.0 Hz, 6H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 155.6, 141.1, 132.7, 122.2, 112.9, 109.7, 100.7, 61.7, 56.4, 52.8, 37.5, 15.1.

IR ν_{max} 2976, 1585, 1484, 1341, 1154, 1059, 968 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+Na]^+$ calcd for $C_{14}H_{22}{}^{79}BrNNaO_5S$ 418.0300, found 418.0288



5-Bromo-6-methoxy-1-(methylsulfonyl)-1*H*-indole (18). A magnetically stirred and chilled (ice-water bath) solution of compound **17** (5.94 g, 15.0 mmol, 1.0 equiv.) in toluene (250 mL) maintained under a nitrogen atmosphere was treated, dropwise, with a solution of titanium tetrachloride (2.14 mL, 19.5 mmol, 1.3 equiv.) in toluene (100 mL). The reaction mixture was then heated to 100 °C, stirred at this temperature for 0.5 h then cooled and quenched with $NaHCO_3$ (100 mL of a saturated aqueous solution). The separated organic phase was washed with HCl (1 × 100 mL of a 1 M aqueous solution) and distilled water (1 × 100 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure to give a crystalline solid. Recrystallisation (from Et_2O) of this material afforded

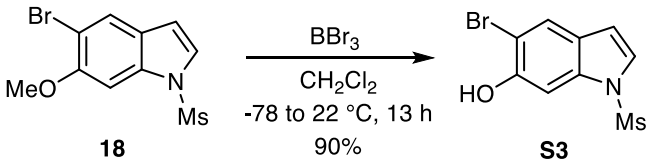
the title compound **18** (4.06 g, 89 %) as a brown solid, R_f = 0.5 (silica, 5:2 v/v petroleum ether/ethyl acetate), m.p. = 129–130 ºC.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.78 (s, 1H), 7.48 (s, 1H), 7.34 (d, *J* = 3.6 Hz, 1H), 6.60 (d, *J* = 3.6 Hz, 1H), 3.97 (s, 3H), 3.08 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 154.0, 135.0, 125.7(4), 125.6(8), 125.2, 108.9, 108.4, 96.9, 56.8, 40.8.

IR ν_{max} 1611, 1472, 1439, 1364, 1336, 1218, 1166, 1126, 1010, 966, 767, 679, 553 cm^{-1}.

HRMS (ESI, +ve) *m/z* $[M+H]^+$ calcd for $C_{10}H_{11}{}^{79}BrNO_3S$ 303.9643, found 303.9644.



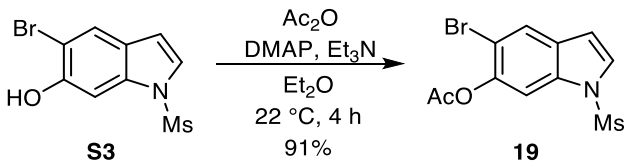
5-Bromo-1-(methylsulfonyl)-1*H*-indol-6-ol (S3). A magnetically stirred solution of compound **18** (12.0 g, 39.5 mmol, 1.0 equiv) in dry CH_2Cl_2 (160 mL) maintained under nitrogen was cooled to –78 °C (using ethanol contained in an Eyela PSL-1820 freezing bath) was treated, over 0.33 h, with BBr_3 (79.0 mL of a 1.0 M in CH_2Cl_2, 79.0 mmol, 2.0 equiv.). The ensuing mixture was stirred at –78 ºC for 0.5 h and then warmed to 22 ºC. After 13 h the reaction mixture was quenched with $NaHCO_3$ (50 mL of a saturated aqueous solution) then diluted with CH_2Cl_2 (80 mL). The separated aqueous phase was extracted with CH_2Cl_2 (3 × 70 mL) and the combined organic phases were then washed with distilled water (1 × 100 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 5:2 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **S3** (10.3 g, 90%) as a white, crystalline solid, m.p. = 139–140 ºC.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.74 (s, 1H), 7.63 (d, *J* = 0.7 Hz, 1H), 7.37 (d, *J* = 3.7 Hz, 1H), 6.61 (dd, *J* = 3.7 and 0.7 Hz, 1H), 5.71 (broadened, 1H), 3.12 (s, 3H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 149.8, 135.3, 126.0, 125.5, 124.2, 107.9, 107.4, 100.2, 40.6.

IR ν_{max} 3478, 1615, 1468, 1432, 1326, 1193, 1159, 1120, 975, 832, 766, 684, 552 cm^{-1}.

HRMS (ESI, +ve) *m/z* $[M+H]^+$ calcd for $C_9H_9{}^{79}BrNO_3S$ 289.9487, found 289.9493.



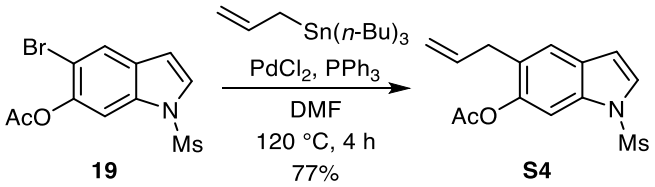
5-Bromo-1-(methylsulfonyl)-1*H*-indol-6-yl acetate (19). A magnetically stirred solution of compound **S3** (5.15 g, 17.7 mmol, 1.0 equiv.) in Et_2O (120 mL) maintained at 22 °C was treated with DMAP (433 mg, 3.55 mmol, 0.2 equiv.), Et_3N (4.93 mL, 35.5 mmol, 2.0 equiv.) and Ac_2O (3.33 mL, 35.5 mmol, 2.0 equiv.). The ensuing mixture was stirred for 4 h then quenched with $NaHCO_3$ (30 mL of a saturated aqueous solution) before being diluted with ethyl acetate (100 mL). The separated aqueous phase was extracted with ethyl acetate (3 × 50 mL) and the combined organic phases were then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 10:3 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **19** (5.37 g, 91%) as a white, crystalline solid, m.p. = 135–137 ºC.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.88 (s, 1H), 7.75 (d, J = 0.8 Hz, 1H), 7.48 (d, J = 3.7 Hz, 1H), 6.69 (dd, J = 3.7 and 0.8 Hz, 1H), 3.14 (s, 3H), 2.42 (s, 3H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 169.0, 145.2, 133.9, 129.8, 127.7, 125.4, 112.0, 108.6, 108.0, 41.2, 20.8.

IR ν_{max} 1764, 1454, 1366, 1197, 1176, 1125, 976, 766, 552 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+Na]^+$ calcd for $C_{11}H_{10}{}^{79}BrNNaO_4S$ 353.9412, found 353.9394.



5-Allyl-1-(methylsulfonyl)-1*H*-indol-6-yl acetate (S4). A magnetically stirred solution of compound **19** (5.37 g, 16.2 mmol) in DMF (30 mL) contained in a pressure tube was treated with triphenylphosphine (850 mg, 3.24 mmol, 0.2 equiv), palladium(II) chloride (144 mg, 0.81 mmol, 0.05 equiv.) and allyltributylstannane (6.03 mL, 19.4 mmol, 1.2 equiv.). After sealing the tube, the ensuing mixture was heated at 120 °C (oil bath) for 24 h and thereafter the now black-green reaction mixture was cooled to 22 ºC before being diluted with ethyl acetate (50 mL) then brine (100 mL). The separated aqueous layer was extracted with ethyl

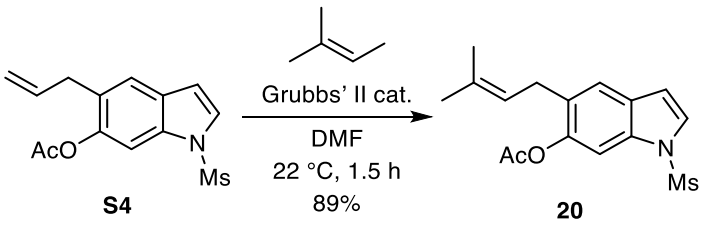
acetate (3 × 40 mL) and the combined organic phases were then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 5:2 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **S4** (3.66 g, 77%) as a clear, yellow oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.64 (s, 1H), 7.49 (s, 1H), 7.42 (d, *J* = 3.7 Hz, 1H), 6.67 (dd, *J* = 3.7 and 0.7 Hz, 1H), 6.04-5.87 (complex m, 1H), 5.12 (m, 2H), 3.40 (d, *J* = 6.6 Hz, 2H), 3.10 (s, 3H), 2.35 (s, 3H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 169.7, 146.7, 136.0, 133.6, 128.8, 128.3, 126.7, 122.4, 116.4, 108.6, 107.4, 40.8, 34.9, 20.9.

IR ν_{max} 1755, 1457, 1365, 1201, 1167, 1137, 1107, 991, 914, 762, 557 cm^{-1}.

HRMS (ESI, +ve) *m/z* $[M+H]^+$ calcd for $C_{14}H_{16}NO_4S$ 294.0800, found 294.0793.



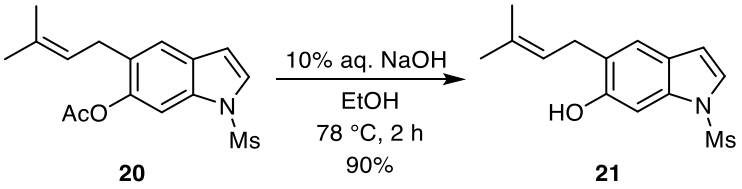
5-(3-Methylbut-2-en-1-yl)-1-(methylsulfonyl)-1*H*-indol-6-yl acetate (20). A magnetically stirred solution of compound **S4** (3.66 g, 12.4 mmol, 1.0 equiv) in CH_2Cl_2 (20 mL) was treated with 2-methyl-2-butene (39.6 mL, 374 mmol, 30 equiv) then Grubbs' II catalyst (741 mg, 0.87 mmol, 0.07 equiv.). The resulting solution was stirred for 2 h at 22 °C then concentrated under reduced pressure and the residue so-obtained subjected to flash column chromatography (silica, 17:3 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **20** (3.57 g, 89%) as a clear, brown oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.47 (s, 1H), 7.41 (d, *J* = 3.7 Hz, 1H), 6.67 (d, *J* = 3.7 Hz, 1H), 5.28 (t, *J* = 7.2 Hz, 1H), 3.33 (d, *J* = 7.2 Hz, 2H), 3.09 (s, 3H), 2.36 (s, 3H), 1.78 (s, 3H), 1.74 (s, 3H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 169.7, 146.7, 133.4, 133.3, 129.8, 128.8, 126.6, 122.0, 121.7, 108.7, 107.2, 40.7, 28.9, 25.8, 20.9, 17.9.

IR ν_{max} 1755, 1455, 1364, 1203, 1167, 1137, 990, 957, 771, 563, 511 cm^{-1}.

HRMS (ESI, +ve) *m/z* $[M+H]^+$ calcd for $C_{16}H_{20}NO_4S$ 322.1113, found 322.1114.



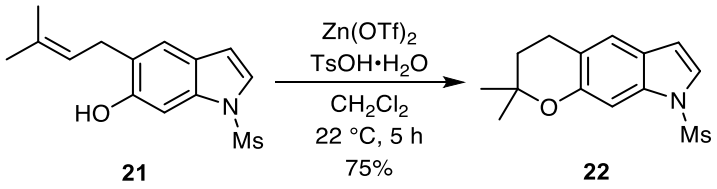
5-(3-Methylbut-2-en-1-yl)-1-(methylsulfonyl)-1*H*-indol-6-ol (21). A magnetically stirred solution of compound **20** (3.57 g, 11.1 mmol, 1.0 equiv) in EtOH (40 mL) was treated with NaOH (44.4 mL of 10% w/v aqueous solution). The ensuing mixture was heated under reflux for 2 h before being cooled then diluted with water (30 mL) and ethyl acetate (50 mL). The separated aqueous layer was extracted with ethyl acetate (3 × 50 mL) and the combined organic phases were then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 3:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **21** (2.79 g, 90%) as a clear, yellow oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.44 (s, 1H), 7.34 (s, 1H), 7.28 (d, *J* = 3.7 Hz, 1H), 6.61 (d, *J* = 3.7 Hz, 1H), 6.18 (broadened s, 1H), 5.38 (t, *J* = 7.2 Hz, 1H), 3.45 (d, *J* = 7.2 Hz, 2H), 3.05 (s, 3H), 1.79 (s, 6H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 152.7, 134.3, 134.2, 125.2, 124.5, 124.3, 122.0, 121.8, 109.1, 99.7, 40.1, 29.3, 25.9, 17.9.

IR ν_{max} 3475, 2925, 1622, 1454, 1350, 1165, 1131, 1105, 990, 838, 767, 565, 510 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{14}H_{18}NO_3S$ 280.1007, found 280.0995.



2,2-Dimethyl-8-(methylsulfonyl)-2,3,4,8-tetrahydropyrano[3,2-*f*]indole (22). A magnetically stirred solution of compound **21** (2.79 g, 9.98 mmol, 1.0 equiv.) in CH_2Cl_2 (40 mL) was treated $Zn(OTf)_2$ (91 mg, 0.25 mmol, 0.025 equiv.) and *p*-TsOH•H_2O (48 mg, 0.25 mmol, 0.025 equiv.). The ensuing mixture was stirred for 5 h at 22 °C then concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum ether/ethyl acetate elution) to afford,

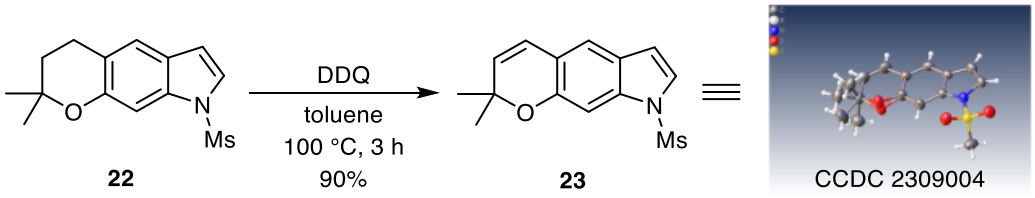
after concentration of the appropriate fractions (R_f = 0.35), compound **22** (2.09 g, 90%) as a white, crystalline solid, m.p. = 156-158 ºC.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.37 (s, 1H), 7.30 (s, 1H), 7.28 (d, J = 3.7 Hz, 1H), 6.57 (d, J = 3.7 Hz, 1H), 3.07 (s, 3H), 2.92 (t, J = 6.8 Hz, 2H), 1.87 (t, J = 6.8 Hz, 2H), 1.39 (s, 6H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 152.5, 134.7, 124.8, 124.0, 121.3, 118.3, 108.4, 101.1, 74.6, 40.1, 32.9, 26.9, 22.8.

IR ν_{max} 2974, 2930, 1630, 1575, 1454, 1352, 1192, 1169, 1136, 1110, 988, 770, 559 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{14}H_{18}NO_3S$ 280.1007, found 280.0990.



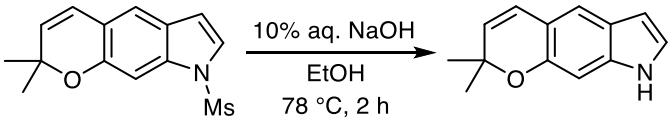
2,2-Dimethyl-8-(methylsulfonyl)-2,8-dihydropyrano[3,2-*f*]indole (23). A magnetically stirred solution of compound **22** (2.09 g, 7.48 mmol, 1.0 equiv.) in toluene (100 mL) was treated with DDQ (3.74 g, 16.5 mmol, 2.2 equiv.) then heated at 100 °C for 3 h. Thereafter the cooled reaction mixture was quenched with Na_2SO_3 (50 mL of a saturated aqueous solution) then diluted with ethyl acetate (50 mL). The separated aqueous layer was extracted with ethyl acetate (3 × 50 mL) and the combined organic phases were dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.33), compound **23** (1.87 g, 90%) as a yellow, crystalline solid, m.p. = 134–135 ºC.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.38 (s, 1H), 7.30 (d, J = 3.7 Hz, 1H), 7.20 (s, 1H), 6.59 (d J = 3.7 Hz, 1H), 6.43 (d, J = 9.8 Hz, 1H), 5.70 (d, J = 9.8 Hz, 1H), 3.10 (s, 3H), 1.48 (s, 6H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 151.5, 135.3, 130.9, 124.9, 124.5, 122.4, 118.8, 118.6, 108.8, 101.0, 76.5, 40.4, 27.9.

IR ν_{max} 2975, 1624, 1459, 1363, 1349, 1170, 1114, 992, 769, 715, 560 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{14}H_{16}NO_3S$ 278.0851, found 278.0836.



23 **24**

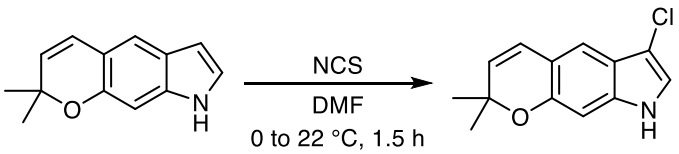
2,2-Dimethyl-2,8-dihydropyrano[3,2-*f*]indole (24). A magentically stirred solution of compound **23** (1.87 g, 6.74 mmol, 1.0 equiv.) in EtOH (60 mL) was treated with NaOH (27.0 mL of 10% w/v aqueous solution). The ensuing mixture was heated under reflux for 2 h then cooled before being diluted with water (60 mL) and ethyl acetate (30 mL). The separated aqueous layer was extracted with ethyl acetate (3 × 40 mL) and the combined organic phases were dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.35), compound **24** (1.21 g, 90%) as a white, crystalline solid, m.p. = 84-85 ºC.

^{1}H NMR (500 MHz, DMSO-d_6) δ 10.82 (s, 1H), 7.18 (s, 1H), 7.13 (broadened s, 1H), 6.72 (s, 1H), 6.45 (d, J = 9.7 Hz, 1H), 6.28 (m, 1H), 5.63 (d, J = 9.7 Hz, 1H), 1.35 (s, 6H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 148.4, 136.3, 128.8, 124.1, 123.4, 122.2, 117.4, 115.1, 101.2, 97.9, 75.2, 27.4.

IR ν_{max} 3404, 2971, 1629, 1463, 1334, 1256, 1130, 1105, 1080, 891, 759, 713 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{13}H_{14}NO$ 200.1075, found 200.1063.



24 **S5**

6-Chloro-2,2-dimethyl-2,8-dihydropyrano[3,2-*f*]indole (S5). A magnetically stirred and chilled (ice/water bath) suspension of compound **24** (1.21 g, 6.07 mmol, 1.0 equiv.) in DMF (8 mL) was treated, dropwise, with a solution of *N*-chlorosuccinimide (811 mg, 6.07 mmol, 1.0 equiv.) in DMF (2 mL). The reaction mixture was warmed to 22 ºC and stirred at this temperature for 1.5 h before being quenched with brine (50 mL) then extracted with ethyl acetate (3 × 50 mL). The combined organic phases were washed with distilled water (1 × 50 mL) then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum

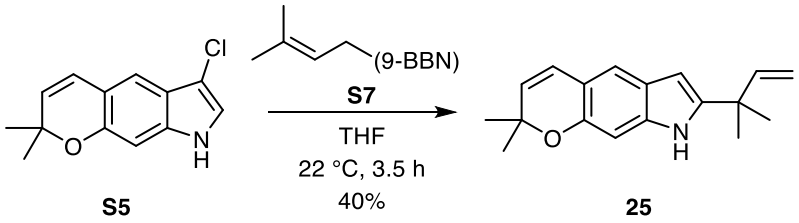
ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.35), compound **S5** (1.06 g, 75%) as a clear, light-green oil.

^{1}H NMR (300 MHz, DMSO-d_6) δ 11.09 (s, 1H), 7.30 (broadened s, 1H), 7.15 (s, 1H), 6.74 (s, 1H), 6.54 (d, J = 9.7 Hz, 1H), 5.71 (d, J = 9.7 Hz, 1H), 1.37 (s, 6H).

^{13}C{^{1}H} NMR (75 MHz, DMSO-d_6) δ 149.9, 135.8, 130.3, 123.4, 121.6, 119.9, 116.6, 115.0, 103.9, 99.0, 76.1, 27.9.

IR ν_{max} 3324, 2924, 2853, 1711, 1636, 1464, 1157, 970 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{13}H_{13}{}^{35}ClNO$ 234.0686, found 234.0674.



2,2-Dimethyl-7-(2-methylbut-3-en-2-yl)-2,8-dihydropyrano[3,2-*f*]indole (25). A magnetically stirred solution of compound **S5** (1.06 g, 4.50 mmol, 1.0 equiv) in THF (15 mL) maintained at 22 °C was treated with triethylamine (2.03 mL, 14.6 mmol, 3.25 equiv.) and, after 0.33 h, dropwise with prenyl-9-BBN (**S7**) (27 mL of a freshly prepared 0.5 M solution in THF, 13.5 mmol, 3.0 equiv. – see below). The ensuing mixture was then concentrated under reduced pressure and the residue so-obtained subjected to flash column chromatography (silica, 8:1 v/v petroleum ether/ethyl acetate elution) to afford two fractions, A and B.

Concentration of fraction A (R_f = 0.35) afforded compound **25** (480 mg, 57% brsm) as a clear, yellow oil.

^{1}H NMR (300 MHz, DMSO-d_6) δ 10.59 (s, 1H), 7.07 (s, 1H), 6.64 (s, 1H), 6.43 (d, J = 9.6 Hz, 1H), 6.07 (m, 1H), 6.00 (m, 1H), 5.60 (d, J = 9.6 Hz, 1H), 5.02 (s, 1H), 4.98 (m, 1H), 1.40 (s, 6H), 1.34 (s, 6H).

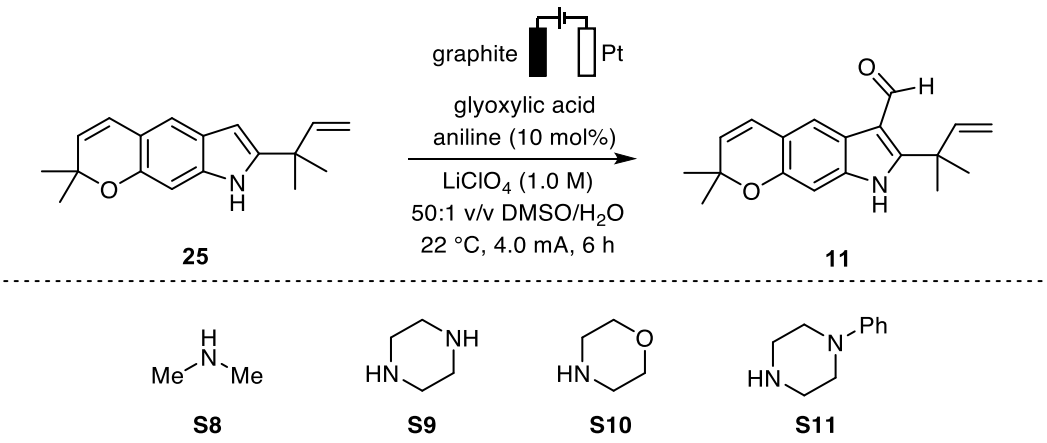
^{13}C{^{1}H} NMR (75 MHz, DMSO-d_6) δ 148.5, 146.8, 145.7, 137.3, 128.9, 124.0, 122.7, 117.3, 115.2, 111.7, 98.1, 97.2, 75.6, 38.2, 27.8, 27.5.

IR ν_{max} 2926, 2857, 1688, 1626, 1466, 1410, 1320, 1257, 1206, 1138, 912, 844, 521 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{18}H_{22}NO$ 268.1701, found 268.1690.

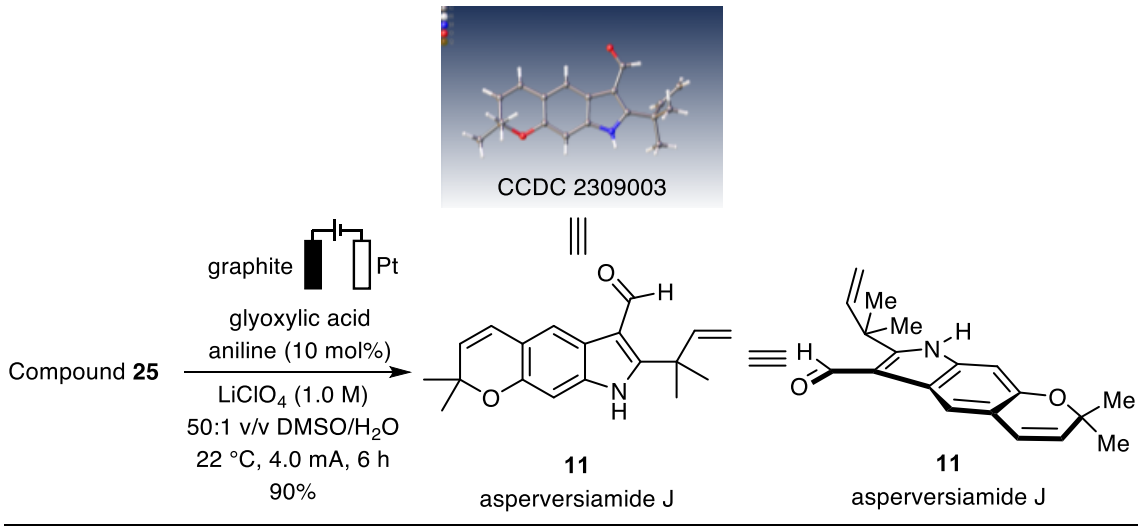
Concentration of fraction B (R_f = 0.2) afforded compound **S5** (318 mg, 30% recovery) as a clear, light-green oil that was identical in all respects with an authentic sample.

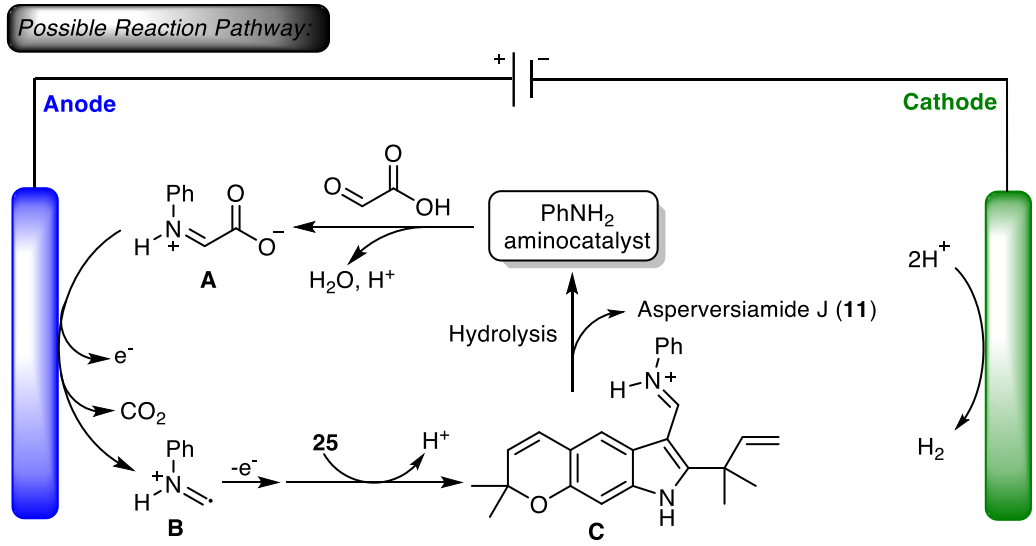
Table S1. Optimization of Electrochemical Formylation Reaction Conditions[a]



Entry	Deviation from standard conditions	Yield(%)[b]
1	**None**	**90**
2	No $LiClO_4$	N.R.
3	No current	N.R.
4	*n*-Bu_4NBF_4 instead of $LiClO_4$	26
5	$NaClO_4$ instead of $LiClO_4$	80
6	**S8** instead of aniline	88
7	**S9** instead of aniline	39
8	**S10** instead of aniline	52
9	**S11** instead of aniline	58
10	DMSO/HFIP(50:1) instead of DMSO/H_2O (50:1)	trace
11	DMSO instead of DMSO/H_2O (50:1)	85
12	MeCN instead of DMSO/H_2O (50:1)	N.R.
13	DMF instead of DMSO/H_2O (50:1)	N.R.
14	2.0 mA, 20 h instead of 4.0 mA, 6 h	84
15	8.0 mA, 3 h instead of 4.0 mA, 6 h	69
16	RVC as anode	83

[a] Reaction conditions: undivided cell, graphite anode (1.0 cm × 1.0 cm × 0.2 cm), Pt cathode (1.0 cm × 1.0 cm × 0.01 cm), **25** (0.25 mmol, 1.0 equiv), glyoxylic acid monohydrate (0.75 mmol, 3.0 equiv), $LiClO_4$ (0.5 mmol, 2.0 equiv), DMSO/H_2O (v/v 50:1, 5 mL), constant current = 4.0 mA, 6 h (3.6 $F \cdot mol^{-1}$), 22 °C. [b] Yield of isolated products.





2,2-Dimethyl-7-(2-methylbut-3-en-2-yl)-2,8-dihydropyrano[3,2-*f*]indole-6-carbaldehyde (Asperversiamide J, 11). A mixture of compound **25** (67 mg, 0.25 mmol, 1.0 equiv.), glyoxylic acid monohydrate (69 mg, 0.75 mmol, 3.0 equiv.), aniline (2.5 µL, 0.025 mmol, 0.1 equiv.), $LiClO_4$ (54 mg, 0.5 mmol, 2.0 equiv) and DMSO/H_2O (v/v 50:1, 5 mL) were added to an undivided cell (10 mL) equipped with a stirring bar. The cell was then equipped with graphite plate (1.0 cm × 1.0 cm × 0.2 cm) as the anode and platinum plate (1.0 cm × 1.0 cm × 0.01 cm) as the cathode and both connected to an AXIOMET AX-3003P DC regulated power supply (see Figure S1 above). The reaction mixture was stirred and electrolyzed at a constant current of 4 mA at 22 °C for 6 h. Thereafter the reaction mixture was quenched with brine (30 mL) then extracted with ethyl acetate (3 × 20 mL). The combined organic phases were then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 3:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the

appropriate fractions (R_f = 0.25), compound **11**[2] (67 mg, 90%) as a white, crystalline solid, m.p. = 201–202 ºC (lit.[2] m.p. = 198–199 °C).

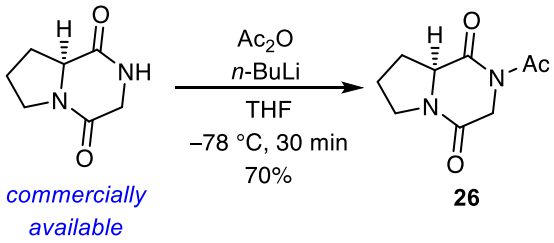
^{1}H NMR (300 MHz, DMSO-d_6) δ 11.40 (s, 1H), 10.21 (s, 1H), 7.77 (s, 1H), 6.78 (s, 1H), 6.50 (d, J = 9.7 Hz, 1H), 6.26 (dd, J = 17.4 and 10.5 Hz, 1H), 5.69 (d, J = 9.7 Hz, 1H), 5.20-5.10 (complex m, 2H), 1.56 (s, 6H), 1.35 (s, 6H).

^{13}C{^{1}H} NMR (75 MHz, DMSO-d_6) δ 185.7, 154.9, 149.4, 146.3, 135.2, 130.0, 123.1, 120.7, 118.5, 117.7, 113.1, 112.1, 98.7, 75.7, 39.6, 28.7, 27.4.

IR ν_{max} 3197, 2971, 2926, 1621, 1579, 1441, 1372, 1153, 1116, 969, 893, 679 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{19}H_{22}NO_2$ 296.1651, found 296.1634.

Part B. Synthesis of Asperversiamide G (8)



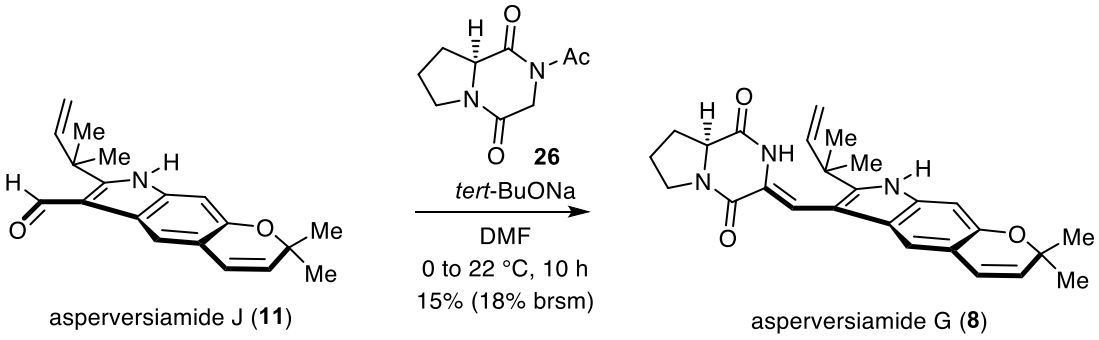
(*S*)-2-Acetylhexahydropyrrolo[1,2-*a*]pyrazine-1,4-dione (26). A magnetically stirred solution of commercially-derived (*S*)-hexahydropyrrolo[1,2-*a*]pyrazine-1,4-dione (315 mg, 2.0 mmol, 1.0 equiv) in anhydrous THF (2.0 mL) maintained at −78 °C (using ethanol contained in an Eyela PSL-1820 freezing bath) under nitrogen was treated with *n*-BuLi (1.6 mL of a 2.5 M solution in THF, 4.0 mmol, 2.0 equiv.). After 0.33 h the ensuing mixture was treated, dropwise, with a solution of Ac_2O (360 µL, 3.8 mmol, 1.9 equiv.) in THF (6 mL). After a further 0.5 h the reaction mixture was poured into a mixture of $NaHCO_3$ (35 mL of a saturated aqueous solution) and ethyl acetate (15 mL). The separated aqueous layer was extracted with ethyl acetate (3 × 15 mL) and the combined organic phases were dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 1:4 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.4), compound **26** (275 mg, 70%) as a clear, colorless oil, $[\alpha]_D^{25}$ –6.36 (*c* 0.4, methanol).

^{1}H NMR (300 MHz, $CDCl_3$) δ 4.95 (d, *J* = 16.7 Hz, 1H), 4.25 (t, *J* = 7.9 Hz, 1H), 3.90 (d, *J* = 16.7 Hz, 1H), 3.56 (m, 2H), 2.54 (s, 3H), 2.42-2.19 (complex m, 2H), 2.07-1.90 (complex m, 2H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 171.5, 169.4, 163.5, 60.6, 47.5, 45.3, 28.1, 27.2, 23.3.

IR ν_{max} 3410, 2924, 1703, 1664, 1442, 1367, 1267, 1202, 973, 592 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_9H_{13}N_2O_3$ 197.0926, found 197.0923.



(*S*,*Z*)-3-((2,2-Dimethyl-7-(2-methylbut-3-en-2-yl)-2,8-dihydropyrano[3,2-*f*]indol-6-yl) methylene)hexahydropyrrolo[1,2-*a*]pyrazine-1,4-dione (Asperversiamide G, 8). A magnetically stirred and chilled (ice-water bath) suspension of compounds **11** (74 mg, 0.25 mmol, 1.0 equiv.) and **26** (197 mg, 1.0 mmol, 4.0 equiv.) in DMF (2.0 mL) maintained under nitrogen was treated, over 2 min., with a solution of *tert*-BuONa (61 mg, 0.625 mmol, 2.5 equiv.) in DMF (1 mL). The ensuing mixture was warmed to 22 ºC and after a further 10 h it was quenched with NH_4Cl (20 mL of a saturated aqueous solution) then extracted with ethyl acetate (3 × 15 mL). The combined organic phases were dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 40:1 v/v dichloromethane/methanol elution) to afford, after concentration of the appropriate fractions (R_f = 0.25), compound **8**[3] (20 mg, 18%) as a yellow solid, m.p. = 221–222 ºC, $[\alpha]_D^{25}$ –1.27 (*c* 0.24, methanol), lit.[3] $[\alpha]_D^{25}$ –1.23 (*c* 0.24, methanol).

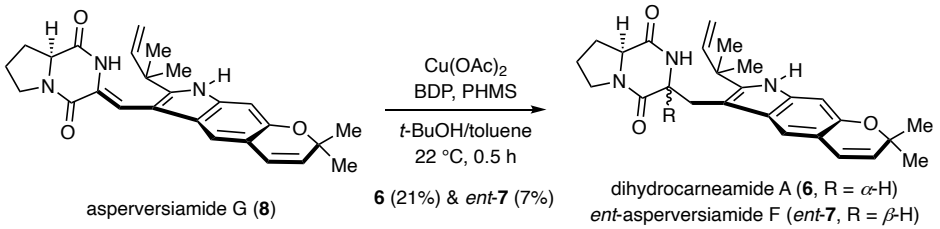
^{1}H NMR (500 MHz, methanol-d_4) δ 7.18 (s, 1H), 6.93 (s, 1H), 6.80 (s, 1H), 6.44 (d, *J* = 9.8 Hz, 1H), 6.10 (m, 1H), 5.62 (d, *J* = 9.8 Hz, 1H), 5.14-5.09 (complex m, 2H), 4.50 (dd, *J* = 9.8 and 6.2 Hz, 1H), 3.76 (m, 1H), 3.64 (m, 1H), 2.41 (m, 1H), 2.12 (m, 1H), 2.05-1.99 (m, 2H), 1.54 (s, 3H), 1.52 (s, 3H), 1.41 (s, 6H).

^{13}C{^{1}H} NMR (126 MHz, methanol-d_4) δ 168.0, 160.8, 150.6, 146.3, 145.1, 137.4, 130.2, 126.0, 124.8, 122.1, 117.7(5), 117.7(3), 114.4, 112.4, 104.9, 99.6, 76.9, 60.5, 46.5, 40.4, 29.8, 28.3, 28.1, 28.0(7), 28.0(5), 22.8.

IR ν_{max} 3303, 2971, 2928, 1686, 1622, 1431, 1383, 1255, 1153, 1116, 736, 688 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{26}H_{30}N_3O_3$ 432.2287, found 432.2276.

Part C. Syntheses of Dihydrocarneamide A (6) and ent-Asperversiamide F (ent-7)



(3*S*,8a*S*)-3-((2,2-Dimethyl-7-(2-methylbut-3-en-2-yl)-2,8-dihydropyrano[3,2-*f*]indol-6-yl)methyl)hexahydropyrrolo[1,2-*a*]pyrazine-1,4-dione (Dihydrocarneamide A, **6) and (3*R*,8a*S*)-3-((2,2-dimethyl-7-(2-methylbut-3-en-2-yl)-2,8-dihydropyrano[3,2-*f*]in-dol-6-yl)methyl)hexahydropyrrolo[1,2-*a*]pyrazine-1,4-dione (*ent*-Asperversiamide F**, ***ent*-7).** A magnetically stirred solution of copper(II) acetate monohydrate (20 mg, 0.1 mmol) and 1,2-bis(diphenylphosphino)benzene (BDP; 4.5 mg, 0.01 mmol) in freshly distilled toluene (6.5 mL) contained in a Schlenk tube and maintained at 22 °C under argon was treated with degassed *tert*-BuOH (1.91 mL, 20.0 mmol). After 1 h the ensuing mixture was treated, *via* syringe, with poly(methylhydrosiloxane) (PMHS; 1.20 mL, 20.0 mmol) and over the following 0.25 h a colour change from blue to yellow was observed. In a second, oven-dried Schlenk tube equipped with a magnetic stirring bar, a solution of compound **8** (44 mg, 0.1 mmol, 1.0 equiv) in freshly distilled toluene (100 µL) and also mainatined under argon, was treated, at 22 °C, with the first solution (97 µL). The ensuing mixture was stirred for 0.5 h then diluted with ethyl acetate (10 mL) before being washed with KOH (1 × 5 mL of a 1.0 M aqueous solution), HCl (1 × 5 mL of a 1.0 M aqueous solution) and brine NaCl (1 × 5 mL) then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 40:1 v/v dichloromethane/methanol elution) to afford two fractions, A and B.

Concentration of fraction A (R_f = 0.4) gave compound **6**[3] (9.1 mg, 21%) as a white, crystalline solid, m.p. = 204–205 ºC (lit.[3] m.p. = 201–202 °C), $[\alpha]_D^{25}$ –34.2 (*c* 0.27, methanol), lit.[3] $[\alpha]_D^{20}$ –33.3 (*c* 0.27, methanol).

^{1}H NMR (600 MHz, methanol-d_4) δ 7.10 (s, 1H), 6.76 (s, 1H), 6.46 (d, *J* = 9.8 Hz, 1H), 6.20 (dd, *J* = 17.5 and 10.6 Hz, 1H), 5.61 (d, *J* = 9.8 Hz, 1H), 5.13 (d, *J* = 17.5 Hz, 1H), 5.09 (d, *J* = 10.6 Hz, 1H), 4.51 (m, 1H), 4.22 (t, *J* = 7.3 Hz, 1H), 3.64-3.51 (complex m, 3H), 3.11 (dd, *J* = 15.1 and 11.1 Hz, 1H), 2.28 (m, 1H), 2.01 (m, 1H), 1.96-1.89 (complex m, 2H), 1.54 (s, 3H), 1.53 (s, 3H), 1.41 (s, 3H), 1.39 (s, 3H).

^{13}C{^{1}H} NMR (151 MHz, methanol-d_4) δ 171.5, 168.0, 150.6, 147.8, 142.2, 137.3, 129.9, 124.9, 124.8, 117.1, 116.2, 112.1, 105.1, 99.2, 76.8, 60.3, 56.2, 46.4, 40.2, 29.3, 28.6, 28.4, 28.0(3), 27.9(6), 27.3, 23.4.

IR ν_{max} 3359, 2968, 2924, 1656, 1415, 1256, 1152, 1113, 1042, 800, 733, 685, 583 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{26}H_{32}N_3O_3$ 434.2444, found 434.2447.

Concentration of fraction B (R_f = 0.25) gave compound *ent*-**7**[3] (3.1 mg, 7%) as a white, crystalline solid, m.p. = 214–215 ºC, {$[\alpha]_D^{25}$ = –84.1 (*c* 0.20, methanol), lit.[3] $[\alpha]_D^{25}$ = +91.2 (*c* 0.22, methanol)}.

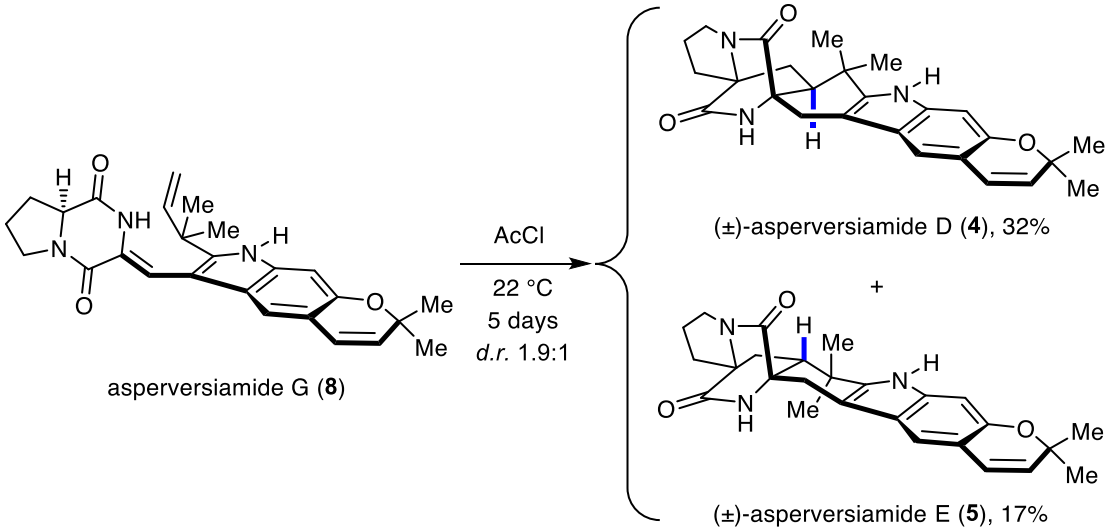
^{1}H NMR (600 MHz, methanol-d_4) δ 7.10 (s, 1H), 6.70 (s, 1H), 6.48 (d, *J* = 9.7 Hz, 1H), 6.19 (dd, *J* = 17.4 and 10.6 Hz, 1H), 5.62 (d, *J* = 9.7 Hz, 1H), 5.16 (d, *J* = 17.4 Hz, 1H), 5.12 (d, *J* = 10.6 Hz, 1H), 4.18 (t, *J* = 5.4 Hz, 1H), 3.50-3.34 (complex m, 4H), 3.29-3.23 (complex m, 2H), 2.10 (m, 1H), 1.91 (m, 1H), 1.75 (m, 1H), 1.52 (s, 3H), 1.51 (s, 3H), 1.41 (s, 3H), 1.39 (s, 3H).

^{13}C{^{1}H} NMR (151 MHz, methanol-d_4) δ 171.5, 168.9, 150.3, 148.0, 142.3, 137.2, 129.8, 125.1, 124.8, 116.9, 116.6, 111.7, 105.5, 98.7, 76.8, 59.7, 59.5, 46.5, 40.5, 30.4, 29.7, 28.7, 28.5, 28.0, 27.9, 22.8.

IR ν_{max} 2960, 2920, 2851, 1650, 1463, 1259, 1018, 799 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{26}H_{32}N_3O_3$ 434.2444, found 434.2446.

Part D. Syntheses of Asperversiamide D (4) and Asperversiamide E (5)



(6a*S*,11a*S*,12a*S*)-2,2,13,13-Tetramethyl-2,6,10,11,12,12a,13,14-octahydro-7*H*,9*H*-6a,-11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione [(±)-Asperversiamide D, (±)-4] and (6a*S*,11a*S*,12a*R*)-2,2,13,13-tetramethyl-2,6,10,11,12,12a,13,14-octahydro-7*H*,9*H*-6a,11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione [(±)-Asperversiamide E, (±)-5]. Compound **8** (11 mg, 0.025 mmol, 1.0 equiv.) and acetyl chloride (1.50 mL) were added to an oven-dried Schlenk tube equipped with a magnetic stirring bar and that then was flushed with argon. The tube was sealed and the mixture contained therein was allowed to stir (in the dark) for 5 days at 22 °C Thereafter the residual acetyl chloride was removed under reduced pressure and the residue thus obtained was subjected to flash column chromatography (silica, 19:1 v/v dichloromethane/methanol elution) to afford two fractions, A and B.

Concentration of fraction A [R_f = 0.2(5)] gave compound (±)-**4**[3] (3.5 mg, 32%) as a white solid, m.p. = 202–203 ºC (lit.[3] m.p. = 198–199 °C).

^{1}H NMR (600 MHz, DMSO-d_6) δ 10.55 (s, 1H), 8.71 (s, 1H), 7.05 (s, 1H), 6.62 (s, 1H), 6.50 (d, J = 9.7 Hz, 1H), 5.62 (d, J = 9.7 Hz, 1H), 3.37 (partially obscured d, J = 15.5 Hz, 1H), 3.34 (m, 1H), 3.26 (m, 1H), 2.63 (d, J = 15.5 Hz, 1H), 2.55 (m, 1H), 2.42 (dd, J = 10.2 and 4.8 Hz, 1H), 2.05 (m, 1H), 1.97 (m, 2H), 1.84 (m, 2H), 1.36 (s, 3H), 1.35 (s, 3H), 1.24 (s, 3H), 0.97 (s, 3H).

^{13}C{^{1}H} NMR (151 MHz, DMSO-d_6) δ 173.2, 168.6, 148.5, 139.8, 136.9, 128.5, 123.7, 121.3, 115.2, 114.6, 103.7, 97.9, 75.3, 66.1, 59.8, 49.2, 43.6, 34.6, 30.2, 28.8, 28.0, 27.5, 27.3, 24.1, 23.9, 21.7.

IR ν_{max} 3363, 2923, 2853, 1637, 1260, 1145, 1023, 994, 827, 751, 545 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{26}H_{30}N_3O_3$ 432.2287, found 432.2279.

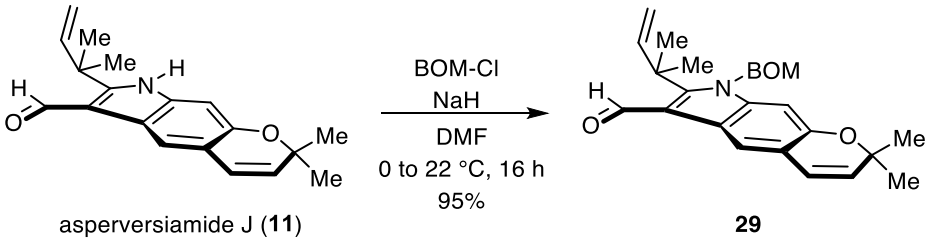
Concentration of fraction B [R_f = 0.2(8)] gave compound (±)-**5**[3] (1.8 mg, 17%) as a white solid, m.p. = 202–203 ºC.

^{1}H NMR (500 MHz, DMSO-d_6) δ 10.58 (s, 1H), 8.54 (s, 1H), 7.10 (s, 1H), 6.65 (s, 1H), 6.49 (d, *J* = 9.7 Hz, 1H), 5.62 (d, *J* = 9.7 Hz, 1H), 3.60 (d, *J* = 17.5 Hz, 1H), 3.44 (m, 1H), 3.38-3.36 (partially obscured m, 1H), 2.73 (d, *J* = 17.5 Hz, 1H), 2.57-2.52 (partially obscured m, 1H), 2.18-2.08 (complex m, 2H), 2.00 (m, 1H), 1.93-1.79 (complex m, 3H), 1.36 (s, 3H), 1.35 (s, 3H), 1.25 (s, 3H), 1.17 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 172.4, 169.1, 148.3, 139.7, 136.9, 128.4, 123.6, 121.6, 115.2, 114.4, 102.9, 97.8, 75.2, 66.4, 60.5, 45.5, 43.6, 34.1, 31.6, 28.5, 27.8, 27.3, 27.2, 23.9, 22.5 (one signal obscured or overlapping).

IR ν_{max} 3279, 2925, 1673, 1470, 1408, 1294, 1147, 1115, 756 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{26}H_{30}N_3O_3$ 432.2287, found 432.2279.



asperversiamide J (**11**) **29**

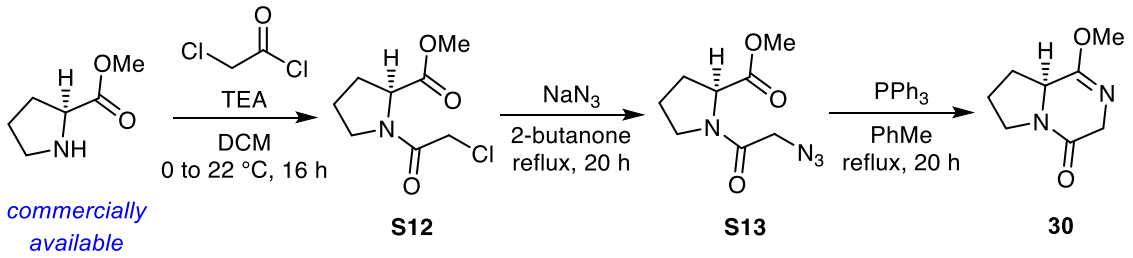
8-((Benzyloxy)methyl)-2,2-dimethyl-7-(2-methylbut-3-en-2-yl)-2,8-dihydropyrano[3, 2-*f*]indole-6-carbaldehyde (29). A magnetically stirred and chilled (ice-water bath) suspension of NaH (60 % dispersion in mineral oil, 205 mg, 5.11 mmol, 5.0 equiv.) in DMF (14.0 mL) maintained under a nitrogen atmosphere was treated, over 0.4 h, with a solution of compound **11** (302 mg, 1.02 mmol, 1.0 equiv.) in DMF (100.0 mL). After evolution of dihydrogen gas had ceased, benzylchloromethyl ether (0.57 mL, 4.09 mmol, 4.0 equiv.) was added in one portion and the resulting solution warmed to 22 ºC and stirred at this temperature for 16 h. The reaction mixture was then quenched with water (60 mL) (CAUTION: possiblity of hydrogen gas evolution) and extracted with ethyl acetate (3 × 20 mL). The combined organic phases were then washed with distilled water (1 × 15 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 12:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **29** (404 mg, 95%) as a yellow oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 10.64 (s, 1H), 8.14 (s, 1H), 7.41 – 7.33 (complex m, 5H), 6.79 (s, 1H), 6.52 (d, J = 9.8 Hz, 1H), 6.23 (dd, J = 17.5, 10.6 Hz, 1H), 5.65 (d, J = 9.8 Hz, 1H), 5.55 (s, 2H), 5.10 (d, J = 10.6 Hz, 1H), 5.02 (d, J = 17.5 Hz, 1H), 4.60 (s, 2H), 1.73 (s, 6H), 1.47 (s, 6H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 188.6, 152.9, 151.0, 146.7, 138.4, 136.6, 129.9, 128.6, 128.2, 128.0, 123.4, 120.3, 118.9, 117.8, 112.6, 97.5, 77.2, 76.3, 73.9, 70.6, 42.0, 30.7, 27.9.

IR ν_{max} 2971, 2922, 1636, 1465, 1359, 1209, 1185, 1158, 1107, 1058, 1107, 1058, 997, 893, 732, 695, 604 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{27}H_{30}NO_3$ 416.2220, found 416.2202.



(*S*)-1-Methoxy-6,7,8,8a-tetrahydropyrrolo[1,2-*a*]pyrazin-4(3*H*)-one (30). A magnetically stirred and chilled (ice-water bath) suspension of *L*-proline methyl ester·HCl (8.04 g, 43 mmol, 1.0 equiv.) in CH_2Cl_2 (85 mL) was added Et_3N (12.0 mL, 86 mmol, 2.0 equiv.), followed by chloroacetyl chloride (3.75 mL, 47 mmol, 1.1 equiv.) dropwise via syringe. The solution was allowed to warm to 22 °C and stirred at this temperature for 16 h. The mixture was then quenched with $NaHCO_3$ (50 mL of a saturated aqueous solution) before being diluted with CH_2Cl_2 (50 mL). The separated aqueous phase was extracted with CH_2Cl_2 (3 × 30 mL) and the combined organic phases were washed with brine (25 mL), dried (Na_2SO_4), filtered, and concentrated in vacuo to afford compound **S12** as a brown oil (7.96 g, 38 mmol). A portion of the compound **S12** (5.35 g, 26 mmol, 1.0 equiv.) was dissolved in butanone (50 mL) at 22 °C, and NaN_3 (3.38 g, 51 mmol, 2.0 equiv.) was added in one portion. The reaction vessel was fitted with a reflux condenser, and the heterogeneous mixture was heated at 80 °C for 20 h. The resulting mixture was filtered and concentrated in vacuo to afford compound **S13** as an orange oil (5.38 g, 25 mmol). A portion of the compound **S13** (1.91 g, 9 mmol, 1.0 equiv.) was dissolved in anhydrous toluene (38 mL), and PPh_3 (2.63 g, 10 mmol, 1.1 equiv.) was added in one portion. After gas evolution steadied, the ensuing mixture was stirred for 20 h at 90 °C then concentrated

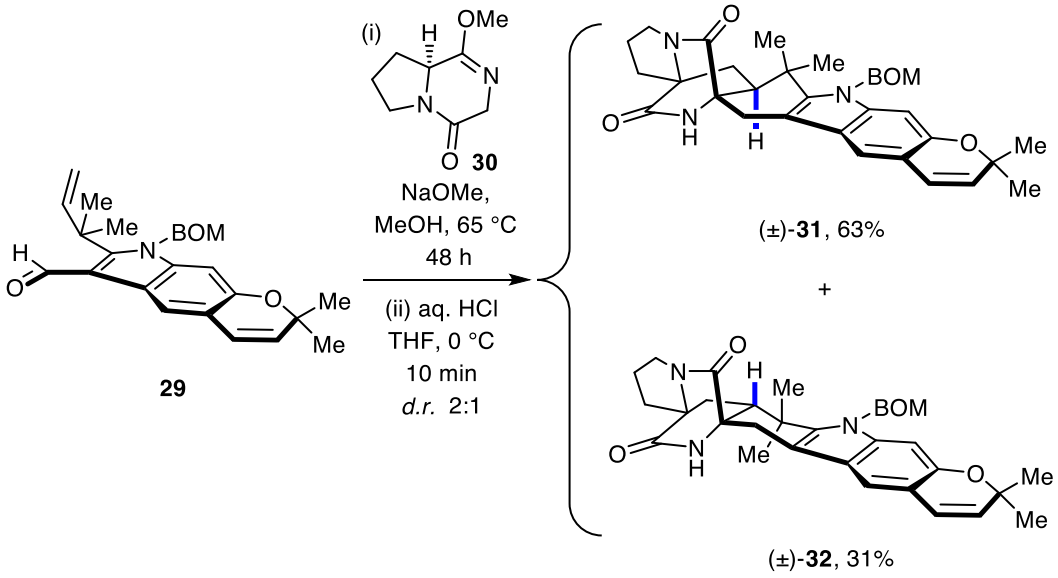
under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 15:1 v/v dichloromethane/methanol elution) to afford, after concentration of the appropriate fractions (R_f = 0.25), compound **30** (1.29 g, 85%) as a yellow oil, $[\alpha]_D^{25}$ +97.4 (*c* 2.00, CH_2Cl_2).

^{1}H NMR (600 MHz, DMSO-d_6) δ 4.19 – 4.14 (m, 1H), 4.06 – 4.00 (m, 1H), 3.91 – 3.85 (m, 1H), 3.66 (s, 3H), 3.50 – 3.42 (m, 1H), 3.31 – 3.23 (m, 1H), 2.22 – 2.15 (m, 1H), 1.95 – 1.88 (m, 1H), 1.85 – 1.75 (m, 1H), 1.75 – 1.65 (m, 1H).

^{13}C{^{1}H} NMR (151 MHz, DMSO-d_6) δ 165.7, 162.4, 56.3, 53.4, 52.3, 44.2, 29.1, 22.3.

IR ν_{max} 3411, 2949, 1637, 1436, 1317, 1259, 1177, 1117, 1020, 749, 721, 696, 671, 539 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_8H_{13}N_2O_2$ 169.0972, found 169.0964.



(6a*S*,11a*S*,12a*S*)-14-((benzyloxy)methyl)-2,2,13,13-tetramethyl-2,6,10,11,12,12a,13,14-octahydro-7H,9H-6a,11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione [(±)-31] and (6a*S*,11a*S*,12a*R*)-14-((benzyloxy)methyl)-2,2,13,13-tetramethyl-2,6,10,11,12,12a,13,14-octahydro-7H,9H-6a,11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione, (±)-32]. A magnetically stirred solution of compound **29** (103 mg, 0.25 mmol, 1.0 equiv.) and compound **30** (126 mg, 0.75 mmol, 3.0 equiv.) in MeOH (0.6 mL) contained in a pressure tube was treated with sodium methoxide (82 mg, 1.5 mmol, 6.0 equiv). After sealing the tube, the ensuing mixture was heated at 70 °C (oil bath) for 48 h then quenched with NH_4Cl (3 mL of a saturated aqueous solution) before being diluted with ethyl acetate (15 mL) and water (10 mL). The separated aqueous layer was extracted with ethyl acetate (2 × 15 mL) and the combined organic

phases were then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was dissolved in THF (22 mL) then cooled to 0 °C. To the mixture was added HCl (7.5 mL of a 0.1 M aqueous solution) and stirred at this temperature for 10 min. The reaction mixture was quenched with $NaHCO_3$ (10 mL of a saturated solution) and extracted with ethyl acetate (3 × 20 mL) and the combined organic phases were then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 33:1 v/v dichloromethane/methanol elution) to afford two fractions, A and B.

Concentration of fraction A [R_f = 0.2] gave compound (±)-**31** (86 mg, 63%) as a white solid, m.p. = 212–213 ºC.

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.74 (s, 1H), 7.36 – 7.28 (complex m, 5H), 7.11 (s, 1H), 6.92 (s, 1H), 6.54 (d, J = 9.8 Hz, 1H), 5.68 (d, J = 9.8 Hz, 1H), 5.59 (d, J = 10.9 Hz, 1H), 5.55 (d, J = 10.9 Hz, 1H), 4.59 (s, 2H), 3.40 – 3.36 (partially obscured m, 1H), 3.31 – 3.24 (partially obscured m, 2H), 2.67 (d, J = 16.0 Hz, 1H), 2.56 – 2.53 (partially obscured m, 1H), 2.50 – 2.47 (partially obscured m, 1H), 2.12 – 2.06 (m, 1H), 2.05 – 1.95 (complex m, 2H), 1.90 – 1.79 (complex m, 2H), 1.38 (s, 3H), 1.38 (s, 3H), 1.34 (s, 3H), 1.07 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 173.1, 168.3, 149.3, 139.3, 138.8, 137.7, 129.1, 128.2, 127.6, 123.1, 120.7, 115.6, 115.2, 107.1, 97.2, 75.5, 73.3, 69.0, 66.0, 58.9, 50.3, 43.5, 35.6, 30.5, 28.6, 27.4, 27.3, 27.2, 24.0, 23.8, 20.3.

IR ν_{max} 3226, 2971, 1684, 1472, 1361, 1334, 1196, 1158, 1108, 1055, 736, 698 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{34}H_{38}N_3O_4$ 552.2857, found 552.2859.

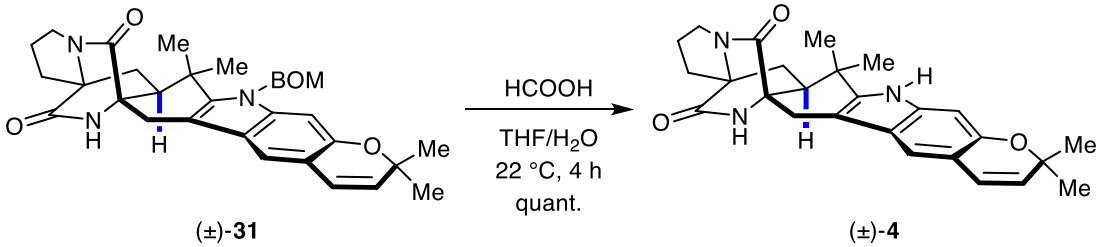
Concentration of fraction B [R_f = 0.3] gave compound (±)-**32** (43 mg, 31%) as a white solid, m.p. = 209–210 ºC.

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.57 (s, 1H), 7.36 – 7.27 (complex m, 5H), 7.17 (s, 1H), 6.94 (s, 1H), 6.52 (d, J = 9.8 Hz, 1H), 5.68 (d, J = 9.8 Hz, 1H), 5.61 (s, 2H), 4.57 (s, 2H), 3.64 (d, J = 17.8 Hz, 1H), 3.45 – 3.40 (m, 1H), 3.38 – 3.36 (partially obscured m, 1H), 2.76 (d, J = 17.8 Hz, 1H), 2.57 – 2.51 (partially obscured m, 1H), 2.21 – 2.13 (complex m, 2H), 2.04 – 1.94 (complex m, 2H), 1.88 – 1.79 (complex m, 2H), 1.38 (s, 3H), 1.38 (s, 3H), 1.35 (s, 3H), 1.27 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 172.4, 169.0, 149.3, 139.4, 138.8, 137.7, 129.0, 128.2, 127.5(9), 127.5(5), 123.1, 121.0, 115.5, 115.4, 106.6, 97.2, 75.5, 73.3, 69.0, 66.4, 59.8, 46.8, 43.6, 35.5, 32.1, 28.5, 27.3(5), 27.3(1), 27.1, 23.9, 22.7, 22.5.

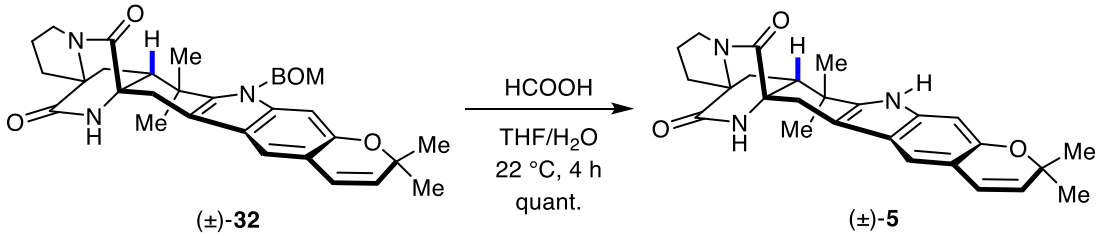
IR ν_{max} 3234, 2924, 1685, 1472, 1405, 1360, 1335, 1182, 1157, 1109, 1054, 738, 698 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{34}H_{38}N_3O_4$ 552.2857, found 552.2859.



(±)-**31** (±)-**4**

(6a*S*,11a*S*,12a*S*)-2,2,13,13-Tetramethyl-2,6,10,11,12,12a,13,14-octahydro-7*H*,9*H*-6a,-11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione [(±)-Aspe-rversiamide D, (±)-4]. A magentically stirred solution of compound **31** (86 mg, 0.15 mmol, 1.0 equiv.) in THF (2.5 mL) and H_2O (2.5 mL) was treated with HCOOH (5 mL). The ensuing mixture was stirred for 4 h at 22 °C then quenched with $NaHCO_3$ (30 mL of a saturated solution) before being diluted with water (20 mL) and ethyl acetate (20 mL) and the separated aqueous layer was extracted with ethyl acetate (3 × 20 mL). The combined organic phases were then washed with water (1× 20 mL), brine (1× 20 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure to give the title compound (±)-**4** (67 mg, quant.) as a white solid that was identical, in all respects, with that obtained as described above (see page S20).

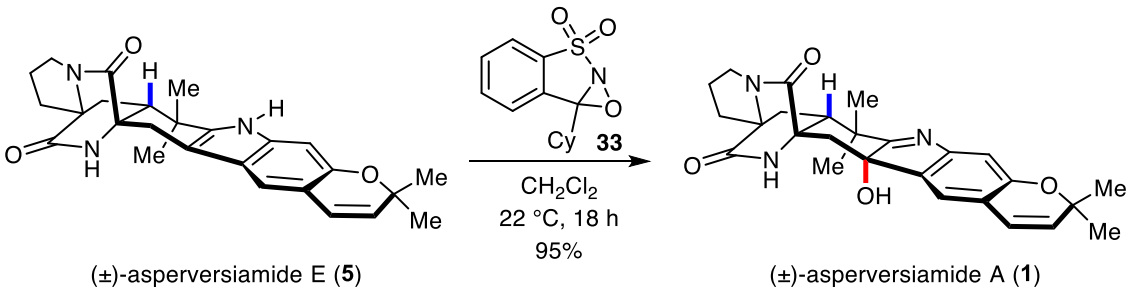


(±)-**32** (±)-**5**

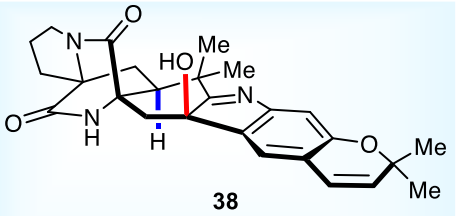
(6a*S*,11a*S*,12a*R*)-2,2,13,13-Tetramethyl-2,6,10,11,12,12a,13,14-octahydro-7*H*,9*H*-6a,11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carba-zole-7,16-dione[(±)-Asperversiamide E, (±)-5]. A magentically stirred solution of compound **32** (43 mg, 0.08 mmol, 1.0 equiv.) in THF (1.3 mL) and H_2O (1.3 mL) was treated with HCOOH (2.5 mL). The ensuing mixture was stirred for 4 h at 22 °C then quenched with $NaHCO_3$ (15 mL of a saturated solution) before being diluted with water (15 mL) and ethyl acetate (10 mL) and the separated aqueous layer was extracted with ethyl acetate (3 × 10 mL). The combined organic phases were then washed with water (1× 10 mL), brine (1× 10 mL) before being

dried (Na_2SO_4), filtered and concentrated under reduced pressure to give the title compound (±)-**5** (33 mg, quant.) as a white solid that was identical, in all respects, with that obtained as described above (see page S21).

Part E. Syntheses of the Structure Assigned to Asperversiamide A (1) and Asperversiamide B (2)



(±)-asperversiamide E (**5**) (±)-asperversiamide A (**1**)



38

proposed revised structure for asperversiamide A

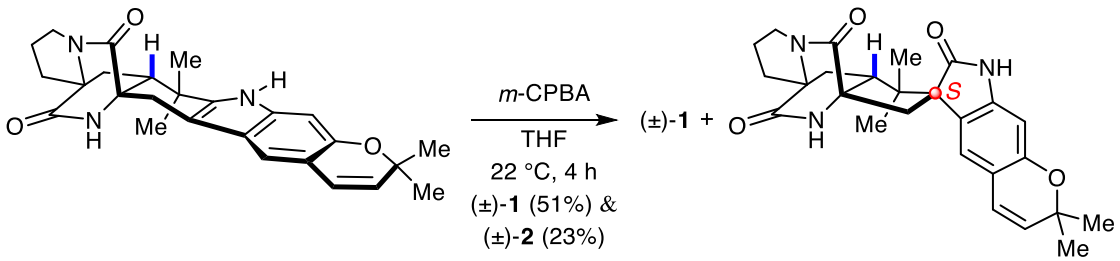
(5b*S*,6a*S*,11a*S*,12a*R*)-5b-Hydroxy-2,2,13,13-tetramethyl-2,5b,6,10,11,12,12a,13-octahydro-7*H*,9*H*-6a,11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione [structure assigned to (±)-Asperversiamide A, (±)-1]. A magnetically stirred solution of compound (±)-**5** (8.6 mg, 0.02 mmol, 1.0 equiv.) in anhydrous CH_2Cl_2 (2.0 mL) maintained at 22 °C was treated with oxaziridine **33** (27 mg, 0.1 mmol, 5.0 equiv). The ensuing mixture was stirred for a further 18 h then quenched with dimethyl sulfide (DMS; 20 µL, 0.27 mmol) then concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 24:1 v/v dichloromethane/methanol elution) to afford, after concentration of the appropriate fractions (R_f = 0.3), compound **1** (8.5 mg, 95%) as a white, crystalline solid, m.p. = 224–225 ºC. The collected spectroscopic data are inconsistent with the literature[3], and the structure reported in the literature[3] needs to be revised to compound **38** (spectroscopic data comparison, see page S85).

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.57 (s, 1H), 7.18 (s, 1H), 6.88 (s, 1H), 6.47 (d, J = 9.8 Hz, 1H), 6.30 (d, J = 1.8 Hz, 1H), 5.73 (d, J = 9.8 Hz, 1H), 3.32-3.25 (partially obscured complex m, 2H), 2.64 (d, J = 15.4 Hz, 1H), 2.55-2.52 (partially obscured m, 1H), 2.17 (m, 1H) 2.02-1.91 (complex m, 3H), 1.84 (m, 2H), 1.73 (dd, J = 15.4 and 1.6 Hz, 1H), 1.40 (s, 3H), 1.38 (s, 3H), 1.36 (s, 3H), 1.20 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 190.2, 171.9, 168.0, 153.5, 152.8, 134.7, 130.0, 122.1, 119.9, 118.5, 108.7, 80.8, 76.2, 66.6, 61.1, 49.8, 43.5, 38.3, 31.4, 28.4, 27.5, 27.3, 27.0, 23.8, 19.5 (one signal obscured or overlapping).

IR ν_{max} 3393, 2957, 2920, 2850, 2359, 1685, 1647, 1468, 1261, 1095, 1021, 801 cm^{-1}.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{26}H_{30}N_3O_4$ 448.2236, found 448.2234.



(±)-asperversiamide E (**5**) (±)-asperversiamide B (**2**)

(rel-5b*S*,6a*S*,11a*S*,12a*R*)-5b-Hydroxy-2,2,13,13-tetramethyl-2,5b,6,10,11,12,12a,13-octa-hydro-7*H*,9*H*-6a,11a-(epiminomethano)indolizino[7,6-*b*]pyrano[3,2-*h*]carbazole-7,16-dione [structure assigned to (±)-Asperversiamide A, (±)-1] and (rel-5a'*S*,6*S*,8a'*R*,9a'*S*)-2,2,8',8'-tetramethyl-2,2',3',8,8a',9'-hexahydro-1'*H*,5'*H*,6'*H*,7*H*,8'*H*-spiro[pyrano[3,2-*f*]indole-6,7'-[5a,9a](epiminomethano)cyclopenta[*f*]indolizine]-5',7,10'-trione [(±)-Asperversiamide B, (±)-2]. A magnetically stirred solution of compound **5** (8.6 mg, 0.02 mmol, 1.0 equiv.) in anhydrous THF (3.0 mL) maintained at 22 °C was treated with *m*-CPBA (8.1 mg of 85% material, 0.04 mmol, 2.0 equiv). After 4 h the reaction mixture was diluted with brine (5 mL), extracted with ethyl acetate (4 × 10 mL) and the combined organic phases then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was was subjected to flash column chromatography (silica, 24:1 v/v dichloromethane/methanol elution) to afford two fractions, A and B.

Concentration of fraction A (R_f = 0.3) gave compound (±)-**1**[3] (4.5 mg, 51%) as a white, crystalline solid that was identical, in all respects, with that obtained as described above.

Concentration of fraction B (R_f = 0.23) gave compound (±)-**2**[3] (2.1 mg, 23%) as a white, crystalline solid, m.p. = 204–205 ºC (lit.[3] m.p. = 198–199 °C).

^{1}H NMR (600 MHz, DMSO-d_6) δ 10.26 (s, 1H), 8.73 (s, 1H), 7.10 (s, 1H), 6.31 (d, *J* = 9.8 Hz, 1H), 6.20 (s, 1H), 5.59 (d, *J* = 9.8 Hz, 1H), 3.29-3.26 (partially obscured and complex m, 2H), 3.12 (dd, *J* = 10.3 and 7.3 Hz, 1H), 2.79 (d, *J* = 15.1 Hz, 1H), 2.48-2.45 (partially

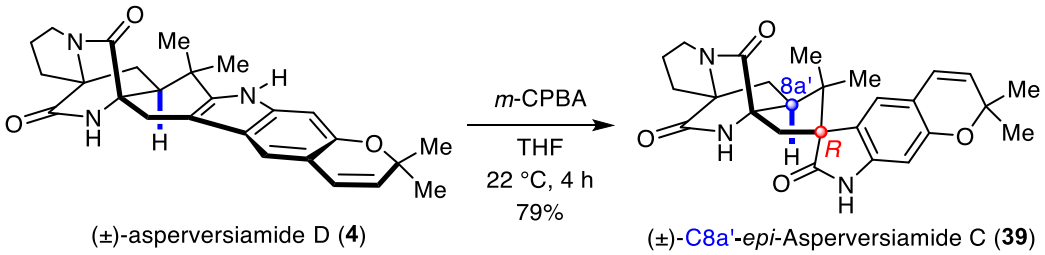
obscured and complex m, 1H), 2.07 (d, J = 15.1 Hz, 1H), 2.02-1.96 (complex m, 1H), 1.93 (m, 1H), 1.84-1.77 (complex m, 2H), 1.65 (dd, J = 12.9 and 7.3 Hz, 1H), 1.38 (s, 3H), 1.36 (s, 3H), 0.99 (s, 3H), 0.69 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 182.2, 172.6, 169.2, 152.9, 143.3, 127.8, 124.4, 122.1, 121.7, 114.1, 97.8, 76.4, 68.6, 67.1, 61.8, 50.2, 46.8, 43.3, 33.9, 28.5, 27.9, 27.7, 24.5, 23.1, 20.5 (one signal obscured or overlapping).

IR ν_{max} 3393, 3188, 2920, 2849, 2361, 2339, 1646, 1469, 1420, 649 cm^{-1}.

HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{26}H_{30}N_3O_4$ 448.2236, found 448.2240.

Part F. Synthesis of C8a'-epi-Asperversiamide C (39)



(±)-asperversiamide D (**4**) (±)-C8a'-*epi*-Asperversiamide C (**39**)

(rel-5a'*S*,6*R*,8a'*S*,9a'*S*)-2,2,8',8'-tetramethyl-2,2',3',8,8a',9'-hexahydro-1'*H*,5'*H*,6'*H*,-7*H*, 8'*H*-spiro[pyrano[3,2-*f*]indole-6,7'-[5a,9a](epiminomethano)cyclopenta[*f*]indolizine]-5',7,10'-trione [(±)-C8a'-*epi*-Asperversiamide C, (±)-39]. A magnetically stirred solution of compound **5** (8.6 mg, 0.02 mmol, 1.0 equiv) in anhydrous THF (3.0 mL) mainatined at 22 °C was treated, in one portion, with *m*-CPBA (8.1 mg of 85% material, 0.04 mmol, 2.0 equiv). After 4 h the reaction mixture was diluted with brine (5 mL), extracted with ethyl acetate (4 × 10 mL) and the combined organic phases then dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 20:1 v/v dichloromethane/methanol elution) to afford, after concentration of the appropriate fractions (R_f = 0.25), compound **39** (7.1 mg, 79%) as a white, crystalline solid, m.p. = 216–217 ºC.

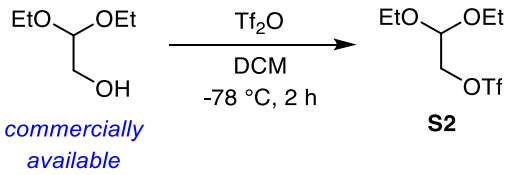
^{1}H NMR (500 MHz, DMSO-d_6) δ 10.31 (s, 1H), 9.09 (s, 1H), 6.88 (s, 1H), 6.37 (d, J = 9.8 Hz, 1H), 6.22 (s, 1H), 5.57 (d, J = 9.8 Hz, 1H), 3.43-3.40 (partially obscured m, 1H), 3.34-3.33 (partially obscured m, 1H), 3.20 (m, 1H), 2.81 (d, J = 14.3 Hz, 1H), 2.55-2.53 (partially obscured m, 1H), 2.16 (d, J = 14.3 Hz, 1H), 2.00 (m, 1H), 1.94 (dd, J = 13.0 and 10.5 Hz, 1H), 1.82-1.73 (complex m, 3H), 1.38 (s, 3H), 1.36 (s, 3H), 0.75 (s, 3H), 0.70 (s, 3H).

^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 182.5, 173.1, 169.4, 152.8, 143.0, 127.7, 123.8, 122.3, 122.0, 114.2, 97.8, 76.2, 68.1, 65.5, 61.0, 55.4, 45.0, 43.3, 33.2, 29.4, 29.0, 27.8, 27.6, 24.3, 23.1, 19.6.

IR ν_{max} 3357, 3188, 2920, 2850, 2361, 2340, 1648, 1469, 1422, 1335, 1136, 720 cm^{-1}.

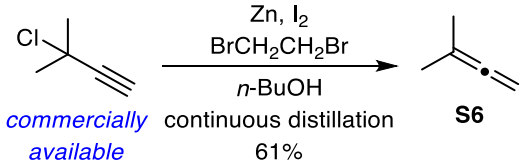
HRMS (ESI, +ve) m/z $[M+H]^+$ calcd for $C_{26}H_{30}N_3O_4$ 448.2236, found 448.2238.

Part G. Synthesis of Compound S2



2,2-Diethoxyethyl trifluoromethanesulfonate (S2). A magnetically stirred solution of 2,2-diethoxyethanol (23.9 mL, 160 mmol) and Et_3N (29.7 mL, 176 mmol) in dichloromethane (120 mL) maintained at –78 °C (using ethanol contained in an Eyela PSL-1820 freezing bath) under a nitrogen atmosphere was treated, dropwise, with a solution of trifluromethanesulfonic anhydride (24.5 mL, 176 mmol) in dichloromethane (100 mL) over 1 h. Stirring was continued for a further 2 h at –78 °C then the reaction was quenched with water (1 × 100 mL) and the separated organic phase washed with water (2 × 100 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure to give the title compound **S2** as a clear, colourless oil, R_f = 0.4 (silica, 9:1 v/v petroleum ether/ethyl acetate), This material was used without further purification in the next step of the reaction sequence.

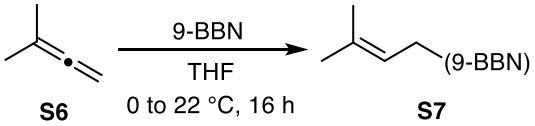
Part H. Syntheses of Compounds S6 and S7



3-Methylbuta-1,2-diene (S6). Zinc powder (31.0 g, 435 mmol, 1.95 equiv) was washed with HCl (4 × 30 mL of a 3% aqueous solution), with $CuSO_4$ (2 × 40 mL of a 2% aqueous solution), with ethanol (2 × 40 mL) and, finally, with *n*-BuOH (2 × 40 mL). The so-treated/activayed zinc was suspended in *n*-BuOH (60 mL) contained in a 3-neck RBF fitted with a dropping funnel, magnetic stirrer bar and a distillation head itself equipped with a 30 cm Vigreux column. 3-Chloro-3-methyl-1-butyne (25.0 mL, 223 mmol, 1.0 equiv.) was placed in the dropping funnel along with 1,2-dibromoethane (1.44 mL, 16.7 mmol, 0.075 equiv). A portion (3 mL) of the alkyne mixture was added to the zinc butanol slurry along with a few crystals of molecular iodine and 1,2-dibromoethane (1.44 mL, 16.7 mmol, 0.075 equiv). While being stirred the mixture was warmed gently using a heat gun until the reaction had clearly commenced. Thereafter, the remainder of the alkyne mixture was added and with with external heating continued as necessary to sustain the reaction. The product was collected by distillation during the course of the reaction and external heat applied so as to maintain a reaction tempertaure of *ca*. 50 °C and enable continued collection of the product. The primary distillate was redistilled to give compound **S6**[4] (9.27 g, 61%) as a clear, colourless liquid, b.p.[4] = 40-42 °C @760 mm Hg.

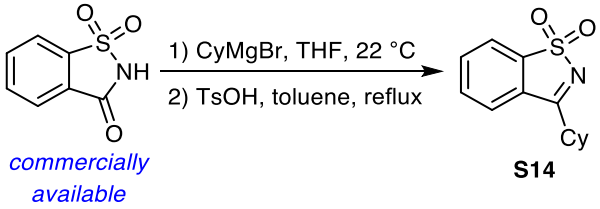
^{1}H NMR (300 MHz, DMSO-d_6) δ 4.59 (hept, J = 3.2 Hz, 2H), 1.65 (t, J = 3.2 Hz, 6H).

^{13}C{^{1}H} NMR (75 MHz, DMSO-d_6) δ 206.5, 94.0, 73.9, 20.2.



Prenyl-9-BBN (S7). A 100 mL RB flask was charged with 9-borabicyclo[3.3.1]nonane (27.0 mL of a 0.5 M solution in THF, 13.5 mmol, 1.0 equiv.) then cooled in an ice-bath. After the clear solution had turned cloudy, 3-methyl-1,2-butadiene (**S6**) (1.59 mL, 16.2 mmol, 1.2 equiv.) was added and the flask was sealed with a septum. The ensuing mixture was warmed to 22 °C and the material formed after 16 h was then used directly in the next step of the reaction sequence.

Part I. Syntheses of Oxaziridines 33 and 34

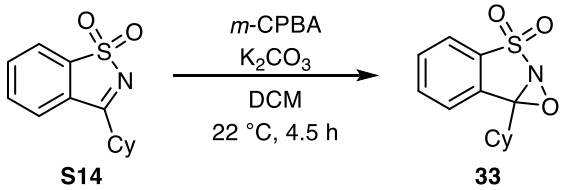


3-Cyclohexylbenzo[*d*]isothiazole 1,1-dioxide (S14). A magnetically stirred solution of saccharin (1.83 g, 10.0 mmol, 1.0 equiv) in degassed THF (20 mL) maintained at 22 °C under nitrogen was treated, dropwise, with cyclohexylmagnesium bromide (15 mL of a 1.0 M solution in THF, 2.0 equiv.). After a further 16 h the reaction mixture was quenched with NH_4Cl (10 mL of a saturated aqueous solution) then the separated aqueous layer extracted with CH_2Cl_2 (3 × 50 mL). The combined organic phases were then washed with brine (1 × 30 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. A solution of the residue thus obtained in toluene (50 mL) was treated with *p*-TsOH (1.38 g, 8.0 mmol, 0.8 equiv.) and the resulting solution heated under reflux for 16 h. Thereafter, the cooled reaction mixture was concentrated under reduced pressure before being treated with NH_4Cl (30 mL of a saturated aqueous solution). The separated aqueous layer was extracted with CH_2Cl_2 (3 × 50 mL) and the combined organic extracts were dried (Na_2SO_4), filtered and the concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.35), compound **S14**[5] (1.12 g, 45%) as a yellow, crystalline solid.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91 (m, 1H), 7.74 (broadened s, 3H), 3.06 (m, 1H), 2.06 (m, 2H), 1.95 (m, 2H), 1.82 (m, 1H), 1.67 (m, 2H), 1.46 (m, 2H), 1.36 (m, 1H).

^{13}C{^{1}H} NMR (151 MHz, $CDCl_3$) δ 179.5, 140.1, 133.8, 133.4, 130.7, 124.1, 122.6, 39.9, 30.2, 25.7 (one signal obscured or overlapping).

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{13}H_{16}NO_2S$ 250.0902, found 250.0891.

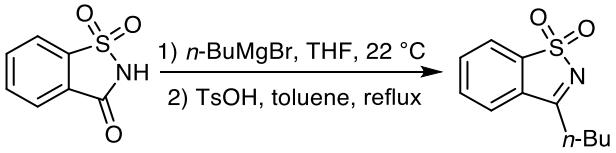


7b-Cyclohexyl-7b*H*-benzo[*d*][1,2]oxazireno[2,3-*b*]isothiazole 3,3-dioxide (33). A magnetically stirred mixture of K_2CO_3 (10 mL of a saturated aqueous solution) and compound **S14** (499 mg, 2.0 mmol, 1.0 equiv) in CH_2Cl_2 (10.0 mL) maintained at 22 °C was treated, dropwise, with a solution of *m*-CPBA (813 mg of 85% material, 4.0 mmol, 2.0 equiv) in CH_2Cl_2 (10 mL). The ensuing mixture was stirred at 22 °C for 4.5 h before being diluted with dichloromethane (100 mL). Thereafter the separated organic phase was washed with distilled water (1 × 30 mL), Na_2SO_3 (1 × 30 mL of a saturated aqueous solution), $NaHCO_3$ (1 × 30 mL of a saturated aqueous solution) and brine (1 × 30 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.4), compound **33**[5] (324 mg, 61%) as a white, crystalline solid, m.p. = 101-102 °C (lit.[5] m.p. = 97-98 °C).

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.91-7.63 (complex m, 4H), 2.62 (m, 1H), 1.96-1.80 (complex m, 4H), 1.80-1.71 (m, 1H), 1.44-1.17 (complex m, 5H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 134.8, 134.1, 133.9, 132.5, 125.9, 124.1, 88.5, 35.7, 28.6, 25.8, 25.6, 25.5, 25.1.

HRMS (ESI, +ve) *m/z* $[M+H]^+$ calcd for $C_{13}H_{16}NO_3S$ 266.0851, found 266.0842.



commercially available

S15

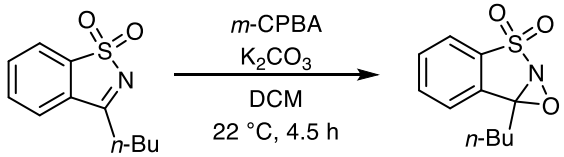
3-Butylbenzo[*d*]isothiazole 1,1-dioxide (S15). A magnetically stirred solution of saccharin (1.83 g, 10.0 mmol, 1.0 equiv) in degassed THF (20 mL) maintained at 22 °C under nitrogen was treated, dropwise, with buthylmagnesium bromide (15 mL of a 1.0 M solution in THF, 2.0 equiv.). After a further 16 h the reaction mixture was quenched with NH_4Cl (10 mL of a saturated aqueous solution) then the separated aqueous layer extracted with CH_2Cl_2 (3 × 50 mL). The combined organic phases were then washed with brine (1 × 30 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. A solution of the residue thus obtained in toluene (50 mL) was treated with *p*-TsOH (1.38 g, 8.0 mmol, 0.8 equiv.) and the resulting solution heated under reflux for 16 h. Thereafter,

the cooled reaction mixture was concentrated under reduced pressure before being treated with NH_4Cl (30 mL of a saturated aqueous solution). The separated aqueous layer was extracted with CH_2Cl_2 (3 × 50 mL) and the combined organic extracts were dried (Na_2SO_4), filtered and the concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 4:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.25), compound **S15**[5] (1.14 g, 51%) as a yellow, crystalline solid.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.93 – 7.86 (m, 1H), 7.79 – 7.69 (complex m, 3H), 2.98 (t, *J* = 7.9 Hz, 2H), 1.93 – 1.80 (m, 2H), 1.59 – 1.44 (m, 2H), 0.99 (t, *J* = 7.3 Hz, 3H).

^{13}C{^{1}H} NMR (75 MHz, $CDCl_3$) δ 176.6, 139.6, 134.0, 133.6, 131.3, 124.1, 122.4, 30.9, 27.4, 22.3, 13.8.

HRMS (ESI, +ve) *m*/*z* $[M+H]^+$ calcd for $C_{11}H_{14}NO_2S$ 224.0740, found 224.0730.



S15 **34**

7b-Butyl-7bH-benzo[*d*][1,2]oxazireno[2,3-*b*]isothiazole 3,3-dioxide (34). A magnetically stirred mixture of K_2CO_3 (10 mL of a saturated aqueous solution) and compound **S15** (447 mg, 2.0 mmol, 1.0 equiv) in CH_2Cl_2 (10.0 mL) maintained at 22 °C was treated, dropwise, with a solution of *m*-CPBA (813 mg of 85% material, 4.0 mmol, 2.0 equiv) in CH_2Cl_2 (10 mL). The ensuing mixture was stirred at 22 °C for 4.5 h before being diluted with dichloromethane (100 mL). Thereafter the separated organic phase was washed with distilled water (1 × 30 mL), Na_2SO_3 (1 × 30 mL of a saturated aqueous solution), $NaHCO_3$ (1 × 30 mL of a saturated aqueous solution) and brine (1 × 30 mL) before being dried (Na_2SO_4), filtered and concentrated under reduced pressure. The residue thus obtained was subjected to flash column chromatography (silica, 5:1 v/v petroleum ether/ethyl acetate elution) to afford, after concentration of the appropriate fractions (R_f = 0.25), compound **34**[5] (325 mg, 68%) as a yellow oil.

^{1}H NMR (300 MHz, DMSO-d_6) δ 8.17 – 8.10 (m, 1H), 8.08 – 8.00 (m, 1H), 7.91 – 7.85 (complex m, 2H), 3.12 (t, *J* = 7.3 Hz, 2H), 1.81 – 1.67 (m, 2H), 1.49 – 1.36 (m, 2H), 0.93 (t, *J* = 7.3 Hz, 3H).

$^{13}C\{^1H\}$ NMR (75 MHz, DMSO-d_6) δ 178.2, 139.0, 135.0, 134.6, 131.2, 125.9, 122.5, 30.5, 27.4, 22.1, 14.1.

HRMS (ESI, +ve) *m/z* $[M+H]^+$ calcd for $C_{13}H_{16}NO_3S$ 266.0851, found 266.0842.

(iii) Crystallographic Studies

Crystallographic Data

Compound **11**. $C_{19}H_{21}NO_2$, M = 295.37, T = 200 K, orthorhombic, space group $P2_12_12_1$, Z = 4, a = 7.3178 (10) Å, b = 132.776 (3) Å, c = 16.414 (5) Å; V = 1654.7 (7) Å^3, D_x = 1.186 Mg m^{-3}, 2704 unique data ($2\theta_{max}$ = 148.8°), R = 0.067 [for 1898 reflections with $I > 2.0\sigma(I)$]; Rw = 0.170 (all data), S = 0.80.

Compound **23**. $C_{14}H_{15}NO_3S$, M = 277.33, T = 170 K, monoclinic, space group $P2_1/c$, Z = 4, a = 12.8280 (5) Å, b = 9.9624 (4) Å, c = 10.6981 (4) Å; β = 97.793 (4)°; V = 1354.57 (9) Å^3, D_x = 1.360 Mg m^{-3}, 2665 unique data ($2\theta_{max}$ = 147.6°), R = 0.038 [for 2432 reflections with $I > 2.0\sigma(I)$]; Rw = 0.108 (all data), S = 1.06.

Structure Determinations

Data for compounds **11** and **23** were collected on Rigaku Super Nova X-ray diffractometer employing CuKα radiation and a graphite monochromator (λ = 1.54184 Å). Using OLEX2,[6] the structure was solved by Intrinsic Phasing with the ShelXT[7] program and refined, using least squares minimization, with the ShelXL[8] package. Atomic coordinates, bond lengths and angles, and displacement parameters have been deposited at the Cambridge Crystallographic Data Centre (CCDC no. 2309003 and 2309004). These data can be obtained free-of-charge via www.ccdc.cam.ac.uk/data_request/cif, by emailing data_request@ccdc.cam.ac.uk, or by contacting The Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge CB2 1EZ, UK; fax: +44 1223 336033.

Crystallographic Details

Crystal data and structure refinement for **11**.

Compound	**11**
CCDC Number	2309003
Empirical formula	$C_{19}H_{21}NO_2$
Formula weight [g mol^{-1}]	295.37
Temperature [K]	200.00 (10)
Crystal system	orthorhombic
Space group	$P2_12_12_1$
Unit cell dimensions [Å]	a = 7.3178 (10)
	b = 13.776 (3)
	c = 16.414 (5)
α [°]	90
β [°]	90
γ [°]	90
Volume [Å^3]	1654.7 (7)
Z	4
ρ_{calc} [g cm^{-3}]	1.186
μ [mm^{-1}]	0.605
F(000)	632
Crystal size [mm^3]	0.16 × 0.12 × 0.09
Radiation	Cu *K*α (λ = 1.54184)
Theta range for data collection [°]	8.38 to 148.73
Index ranges	-5 ⩽ h ⩽ 8, -16 ⩽ k ⩽ 15, -20 ⩽ l ⩽ 19
Reflections collected	4102
Independent reflections	2704 [R_{int} = 0.0873, R_{sigma} = 0.1701]
Data / restraints / parameters	2704 / 7 / 204
Goodness-of-fit on F^2	0.803
Largest diff. peak/hole [e. Å^{-3}]	0.22 / -0.22
Flack parameter	-0.8 (8)

Bond lengths [Å] and angles [°] of **11**

O3-C4	1.470(5)	C13-C15	1.550(4)	N1-C7-C6	129.8(3)
O3-C5	1.380(5)	C13-C16	1.490(6)	N1-C7-C8	107.7(3)
O2-C11	1.212(4)	C16-C17	1.360(6)	C6-C7-C8	122.3(4)
N1-C7	1.381(5)			C7-C8-C10	105.5(3)
N1-C12	1.359(4)	C5-O3-C4	119.0(3)	C9-C8-C7	118.2(3)
C1-C2	1.445(6)	C12-N1-C7	110.3(3)	C9-C8-C10	136.1(3)
C1-C5	1.421(5)	C5-C1-C2	117.9(4)	C8-C9-C1	120.4(3)
C1-C9	1.393(5)	C9-C1-C2	123.1(3)	C11-C10-C8	123.2(3)
C2-C3	1.342(6)	C9-C1-C5	118.9(4)	C12-C10-C8	107.7(3)
C3-C4	1.478(6)	C3-C2-C1	121.0(4)	C12-C10-C11	129.1(4)
C4-C18	1.523(6)	C2-C3-C4	120.6(4)	O2-C11-C10	125.0(4)
C4-C19	1.524(7)	O3-C4-C3	111.2(4)	N1-C12-C10	108.7(3)
C5-C6	1.350(5)	O3-C4-C18	103.5(3)	N1-C12-C13	121.0(3)
C6-C7	1.387(5)	O3-C4-C19	107.1(4)	C10-C12-C13	130.2(3)
C7-C8	1.412(4)	C3-C4-C18	114.6(4)	C12-C13-C15	109.5(3)
C8-C9	1.382(5)	C3-C4-C19	109.6(4)	C14-C13-C12	109.3(4)
C8-C10	1.451(5)	C18-C4-C19	110.5(4)	C14-C13-C15	107.0(4)
C10-C11	1.437(5)	O3-C5-C1	119.3(4)	C16-C13-C12	108.4(4)
C10-C12	1.376(5)	C6-C5-O3	118.5(3)	C16-C13-C14	114.5(3)
C12-C13	1.529(5)	C6-C5-C1	121.8(4)	C16-C13-C15	108.1(4)
C13-C14	1.526(6)	C5-C6-C7	118.2(3)	C17-C16-C13	124.9(5)

Crystal data and structure refinement for **23**.

Compound	**23**
CCDC Number	2309004
Empirical formula	$C_{14}H_{15}NO_3S$
Formula weight [g mol^{-1}]	277.33
Temperature [K]	170.00(10)
Crystal system	monoclinic
Space group	$P2_1/c$
Unit cell dimensions [Å]	a = 12.8280 (5)
	b = 9.9624 (4)
	c = 10.6981 (4)
α [°]	90
β [°]	97.793 (4)
γ [°]	90
Volume [Å^3]	1354.57 (9)
Z	4
ρ_{calc} [g cm^{-3}]	1.36
μ [mm^{-1}]	2.163
F(000)	584
Crystal size [mm^3]	0.14 × 0.12 × 0.1
Radiation	Cu *K*α (λ = 1.54184)
Theta range for data collection [°]	3.5 to 73.4
Index ranges	-15 ⩽ h ⩽ 14, -12 ⩽ k ⩽ 7, -13 ⩽ l ⩽ 11
Reflections collected	5201
Independent reflections	2665 [R_{int} = 0.021, R_{sigma} = 0.623]
Data / restraints / parameters	2665 / 0 / 208
Goodness-of-fit on F^2	1.06
Largest diff. peak/hole [e. Å^{-3}]	0.22 / -0.21
Flack parameter	0.0045 (5)

Bond lengths [Å] and angles [°] of **23**

C1-C2	1.343(3)	C11-C14A	1.480(6)	C8-C7-C6	119.38(14)
O1-C6	1.404(5)			C8-C7-C9	123.10(14)
O1-C11	1.433(4)	C2-C1-N1	109.04(14)	C7-C8-C3	120.15(14)
C2-C3	1.435(2)	C4-N1-C1	108.38(13)	C10-C9-C7	120.49(15)
C3-C4	1.406(2)	C6-O1-C11	118.5(4)	C9-C10-C11	122.89(15)
C3-C8	1.393(2)	C1-C2-C3	108.55(14)	O1-C11-C10	112.4(2)
C4-C5	1.387(2)	C4-C3-C2	107.05(14)	O1-C11-C13	124.4(6)
C5-C6	1.379(2)	C8-C3-C2	134.37(15)	O1-C11-C14	81.8(6)
C6-O1A	1.413(2)	C8-C3-C4	118.51(14)	C10-C11-C14	106.3(2)
C6-C7	1.392(5)	N1-C4-C3	106.97(13)	C10-C11-C13A	101.9(2)
C7-C8	1.379(2)	C5-C4-N1	130.04(13)	C13-C11-C10	115.0(2)
C7-C9	1.456(2)	C5-C4-C3	122.96(14)	C13-C11-C14	110.3(4)
C9-C10	1.323(3)	C6-C5-C4	116.68(14)	O1A-C11-C10	113.6(2)
C10-C11	1.500(2)	O1-C6-C7	119.1(3)	O1A-C11-C13A	78.4(7)
C11-C13	1.487(4)	C5-C6-O1	116.74(19)	O1A-C11-C14A	125.1(5)
C11-C14	1.555(4)	C5-C6-C7	122.26(14)	C14A-C11-C10	116.6(3)
C11-O1A	1.463(5)	O1A-C6-C7	121.0(3)	C14A-C11-C13A	110.9(6)
C11-C13A	1.568(6)	C6-C7-C9	117.52(15)	C6-O1A-C11	117.3(5)

(iv) ORTEPs Derived from Crystallographic Studies on Compounds 11 and 23

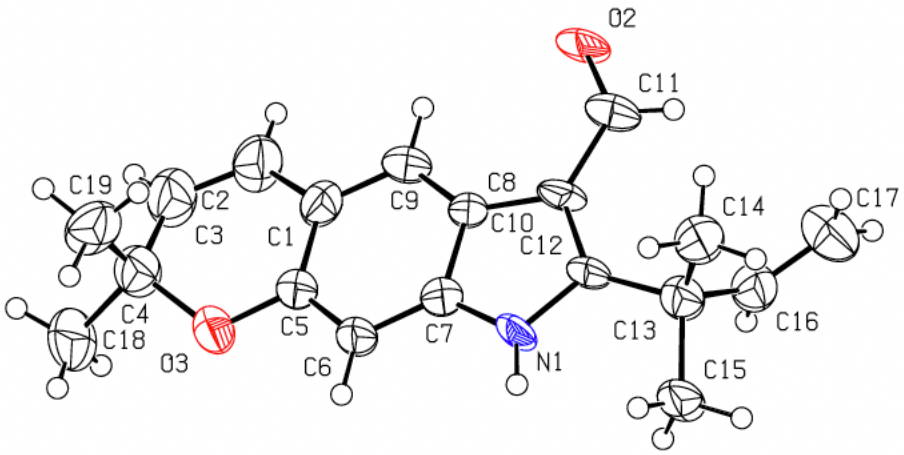


Figure S1: ORTEP derived from a single-crystal X-ray analysis of compound **11** (displacement ellipsoids show 50% probability levels) (CCDC No. 2309003).

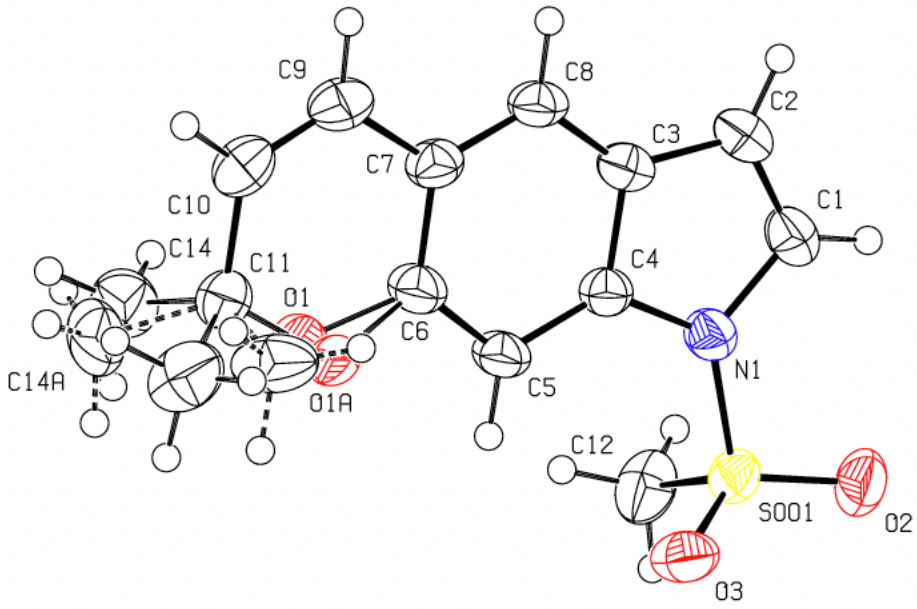
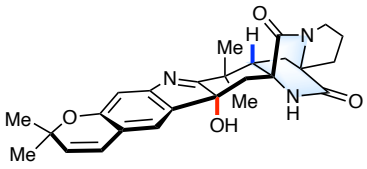


Figure S2: ORTEP derived from a single-crystal X-ray analysis of compound **23** (displacement ellipsoids show 50% probability levels) (CCDC No. 2309004).

(v) Tabular Comparsions of the $^{13}C\{^1H\}$ NMR Spectral Data Obtained on Compounds (±)-1, (±)-2, (±)-4, (±)-5, 6, ent-7, 8 and 11 with Those Reported for the Natural Products Asperversiamides A, B, D, E, F, G and J and Dihydrocarneamide A, respectively

Table S1: Comparison of the $^{13}C\{^1H\}$ NMR spectral data reported for Asperversiamide A with those recorded on synthetically-derived compound (±)-**1**

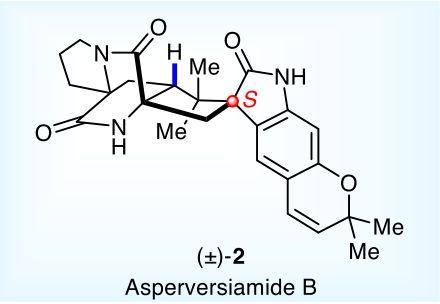


(±)-**1**
structure originally assigned to
Asperversiamide A

Asperversiamide A[a,b]	Compound (±)-**1**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
189.9	190.2	+0.3
172.2	171.9	–0.3
171.2	168.0	–3.2
153.5	153.5	0
152.6	152.8	+0.2
134.9	134.7	–0.2
130.1	130.0	–0.1
122.1	122.1	0
120.1	119.9	–0.2
118.7	118.5	–0.2
108.7	108.7	0
80.1	80.8	+0.7
76.3	76.2	–0.1
66.7	66.6	–0.1
60.4	61.1	+0.7
54.8	49.8	–5.0
44.2	43.5	–0.7
40.2	38.3	–1.9
30.4	31.4	+1.0
28.4	28.4	0
27.5(0)	27.5	0
27.4(7)	27.3	–0.2
26.3	27.0	+0.7
24.1	23.8	–0.3
17.2	19.5	+2.3

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b] spectrum recorded in $(CD_3)_2SO$ at 151 MHz; [c] spectrum recorded in $(CD_3)_2SO$ at 126 MHz.

Table S2: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Asperversiamide B with those recorded on synthetically-derived compound (±)-**2**

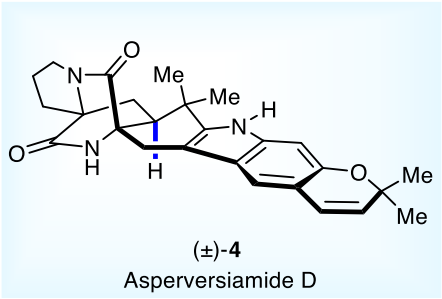


(±)-**2**
Asperversiamide B

Asperversiamide B[a,b]	Compound (±)-**2**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
182.2	182.2	0
172.6	172.6	0
169.2	169.2	0
152.9	152.9	0
143.2	143.3	+0.1
127.8	127.8	0
124.3	124.4	+0.1
122.1	122.1	0
121.7	121.7	0
114.1	114.1	0
97.8	97.8	0
76.4	76.4	0
68.6	68.6	0
67.1	67.1	0
61.8	61.8	0
50.2	50.2	0
46.8	46.8	0
43.3	43.3	0
33.9	33.9	0
28.5	28.5	0
28.1	28.1	0
27.9	27.9	0
27.7	27.7	0
24.5	24.5	0
23.0	23.1	+0.1
20.5	20.5	0

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b] spectrum recorded in $(CD_3)_2SO$ at 151 MHz; [c] spectrum recorded in $(CD_3)_2SO$ at 126 MHz.

Table S3: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Asperversiamide D with those recorded on synthetically-derived compound (±)-**4**

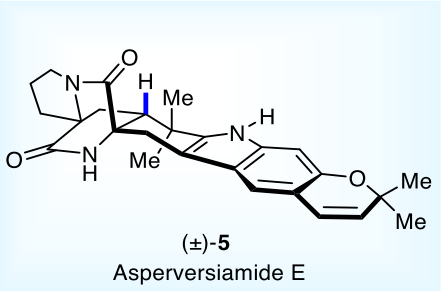


(±)-**4**
Asperversiamide D

Asperversiamide D[a,b]	Compound (±)-**4**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
173.2	173.2	0
168.6	168.6	0
148.4	148.5	+0.1
139.7	139.8	+0.1
136.9	136.9	0
128.5	128.5	0
123.6	123.7	+0.1
121.3	121.3	0
115.2	115.2	0
114.5	114.6	+0.1
103.6	103.7	+0.1
97.9	97.9	0
75.3	75.3	0
66.1	66.1	0
59.7	59.8	+0.1
49.2	49.2	0
43.6	43.6	0
34.5	34.6	+0.1
30.1	30.2	+0.1
28.7	28.8	+0.1
28.0	28.0	0
27.4	27.5	+0.1
27.3	27.3	0
24.1	24.1	0
23.9	23.9	0
21.6	21.7	+0.1

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b] spectrum recorded in $(CD_3)_2SO$ at 101 MHz; [c] spectrum recorded in $(CD_3)_2SO$ at 151 MHz.

Table S4: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Asperversiamide E with those recorded on synthetically-derived compound (±)-**5**

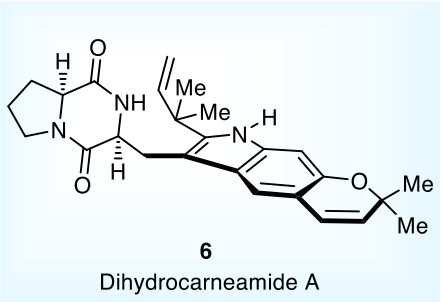


(±)-**5**
Asperversiamide E

Asperversiamide E[a,b]	Compound (±)-**5**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
172.4	172.4	0
169.1	169.1	0
148.3	148.3	0
139.7	139.7	0
136.9	136.9	0
128.4	128.4	0
123.6	123.6	0
121.7	121.6	–0.1
115.2	115.2	0
114.4	114.4	0
102.9	102.9	0
97.8	97.8	0
75.2	75.2	0
66.4	66.4	0
60.5	60.5	0
45.5	45.5	0
43.6	43.6	0
34.1	34.1	0
31.6	31.6	0
28.6	28.5	–0.1
27.8	27.8	0
27.3	27.3	0
27.3	27.2	–0.1
23.9	23.9	0
22.6	22.5	–0.1

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b] spectrum recorded in $(CD_3)_2SO$ at 101 MHz; [c] spectrum recorded in $(CD_3)_2SO$ at 126 MHz.

Table S5: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Dihydrocarneamide A with those recorded on synthetically-derived compound **6**

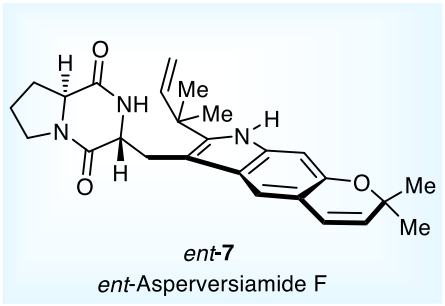


6
Dihydrocarneamide A

Dihydrocarneamide A[a,b]	Compound **6**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
171.5	171.5	0
168.0	168.0	0
150.6	150.6	0
147.8	147.8	0
142.2	142.2	0
137.3	137.3	0
129.9	129.9	0
124.9	124.9	0
124.8	124.8	0
117.1	117.1	0
116.2	116.2	0
112.1	112.1	0
105.0	105.1	+0.1
99.2	99.2	0
76.8	76.8	0
60.3	60.3	0
56.2	56.2	0
46.4	46.4	0
40.2	40.2	0
29.3	29.3	0
28.6	28.6	0
28.3	28.4	+0.1
28.0	28.0(3)	0
28.0	27.9(6)	0
27.3	27.3	0
23.4	23.4	0

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b]spectrum recorded in CD_3OD at 101 MHz; [c]spectrum recorded in CD_3OD at 151 MHz.

Table S6: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Asperversiamide F with those recorded on synthetically-derived compound *ent*-**7**

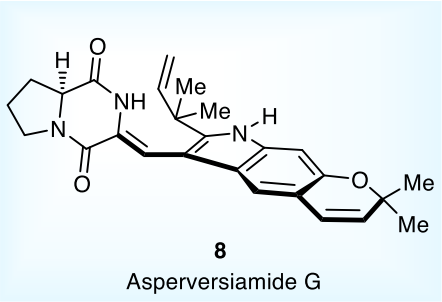


ent-**7**
ent-Asperversiamide F

Asperversiamide F[a,b]	Compound *ent*-**7**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
171.5	171.5	0
168.9	168.9	0
150.4	150.3	–0.1
148.0	148.0	0
142.4	142.3	–0.1
137.3	137.2	–0.1
129.8	129.8	0
125.1	125.1	0
124.8	124.8	0
116.9	116.9	0
116.6	116.6	0
111.7	111.7	0
105.5	105.5	0
98.7	98.7	0
76.8	76.8	0
59.7	59.7	0
59.5	59.5	0
46.5	46.5	0
40.5	40.5	0
30.4	30.4	0
29.7	29.7	0
28.7	28.7	0
28.5	28.5	0
28.0	28.0	0
27.9	27.9	0
22.8	22.8	0

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b]spectrum recorded in CD_3OD at 101 MHz; [c]spectrum recorded in CD_3OD at 151 MHz.

Table S7: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Asperversiamide G with those recorded on synthetically-derived compound **8**

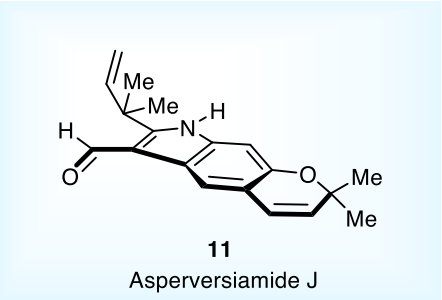


8
Asperversiamide G

Asperversiamide G[a,b]	Compound **8**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
168.1	168.0	–0.1
160.9	160.8	–0.1
150.6	150.6	0
146.3	146.3	0
145.1	145.1	0
137.4	137.4	0
130.2	130.2	0
–	126.0	–
124.8	124.8	0
122.1	122.1	0
121.9	–	–
117.8	117.7(5)	–0.1
117.7	117.7(3)	0
114.4	114.4	0
112.4	112.4	0
104.9	104.9	0
99.6	99.6	0
76.9	76.9	0
60.5	60.5	0
46.5	46.5	0
40.4	40.4	0
29.8	29.8	0
28.3	28.3	0
28.1(7)	28.1	0
28.1(5)	28.0(7)	–0.1
28.0	28.0(5)	0
22.8	22.8	0

[a] data taken from Zhang *et al*. *J. Org. Chem*. **2018**, *83*, 8483-8492 (ref. 3); [b] spectrum recorded in CD_3OD at 101 MHz; [c] spectrum recorded in CD_3OD at 126 MHz.

Table S8: Comparison of the $^{13}C\{^{1}H\}$ NMR spectral data reported for Asperversiamide J with those recorded on synthetically-derived compound **11**



11
Asperversiamide J

Asperversiamide J[a,b]	Compound **11**[c]	chemical shift difference
δ_C	δ_C	$\Delta\delta$
185.6	185.6	0
154.9	154.9	0
149.4	149.4	0
146.3	146.3	0
135.2	135.1	–0.1
130.0	130.0	0
123.1	123.1	0
120.7	120.7	0
118.5	118.5	0
117.7	117.7	0
113.1	113.1	0
112.1	112.1	0
98.7	98.7	0
75.6	75.6	0
40.1	40.0	–0.1
28.7	28.7	0
27.4	27.3	–0.1

[a] data taken from Zhang *et al*. *J. Nat. Prod*. **2019**, *82*, 2181-2188 (ref. 2); [b] spectrum recorded in $(CD_3)_2SO$ at 101 MHz; [c] spectrum recorded in $(CD_3)_2SO$ at 75 MHz.

(vi) References

1. W. C. Still, M. Kahn, A. Mitra. *J. Org. Chem*. **1978**, *43*, 2923−2925.
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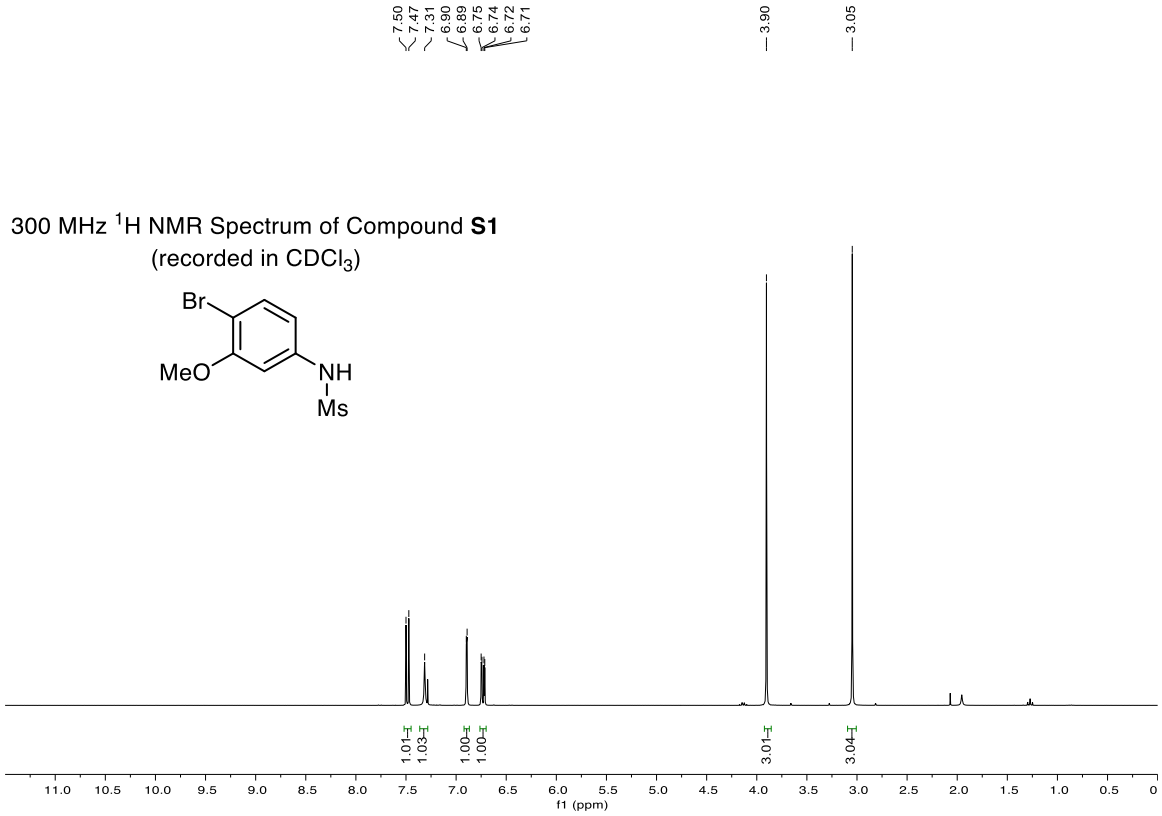
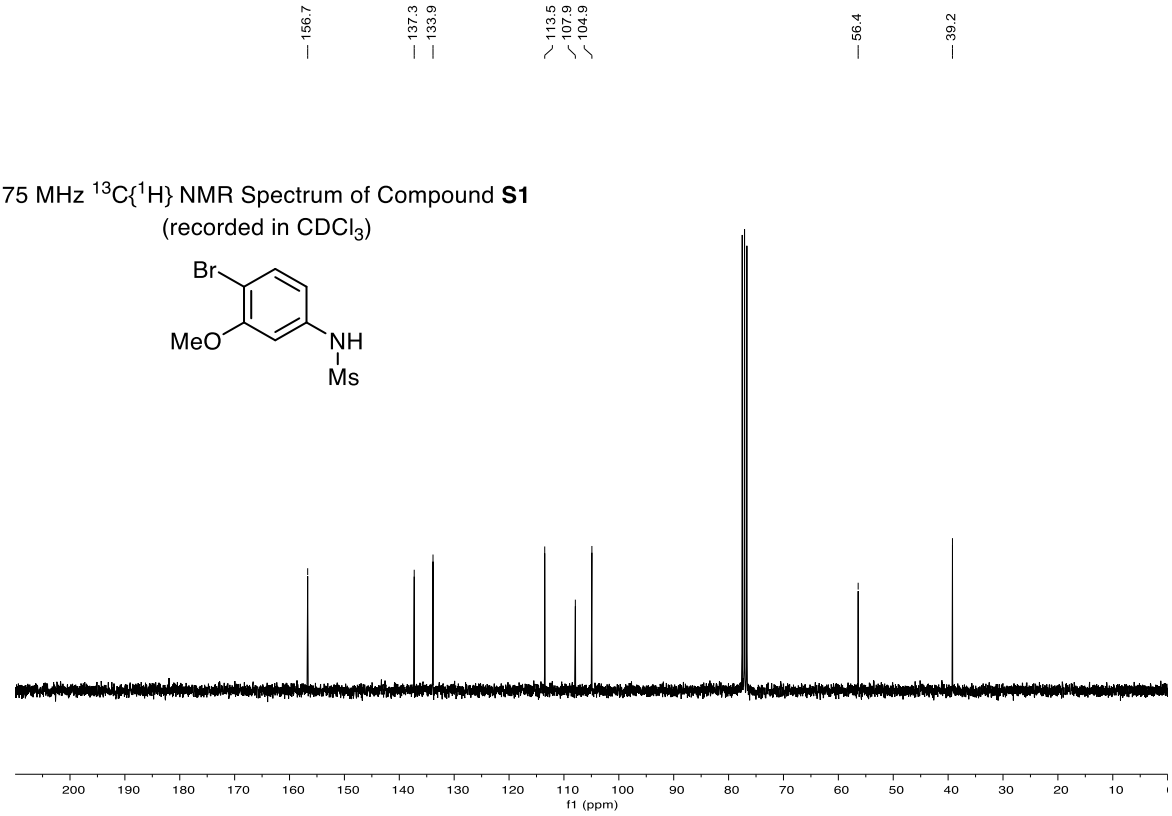
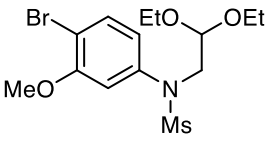
8. G. M. Sheldrick, *Acta Cryst*. **2015**, *C71*, 3−8.

(vii) ^{1}H-, and $^{13}C\{^{1}H\}$-NMR Spectra

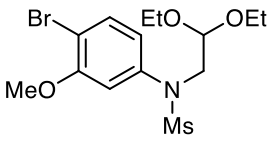




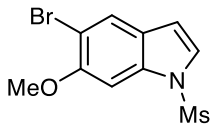
500 MHz ^{1}H NMR Spectrum of Compound **17**
(recorded in DMSO-d_6)



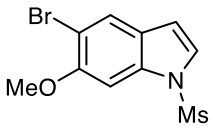
126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **17**
(recorded in DMSO-d_6)



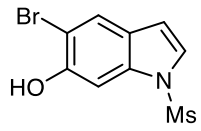
500 MHz ^{1}H NMR Spectrum of Compound **18**
(recorded in $CDCl_3$)



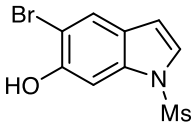
126 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **18**
(recorded in $CDCl_3$)



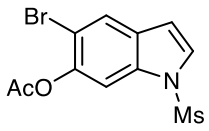
300 MHz ^{1}H NMR Spectrum of Compound **S3**
(recorded in $CDCl_3$)



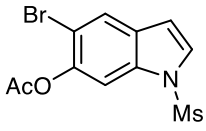
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **S3**
(recorded in $CDCl_3$)



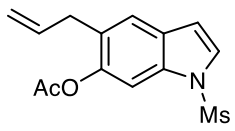
300 MHz ^{1}H NMR Spectrum of Compound **19**
(recorded in $CDCl_3$)



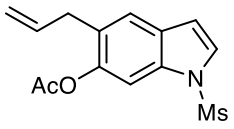
75 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **19**
(recorded in $CDCl_3$)

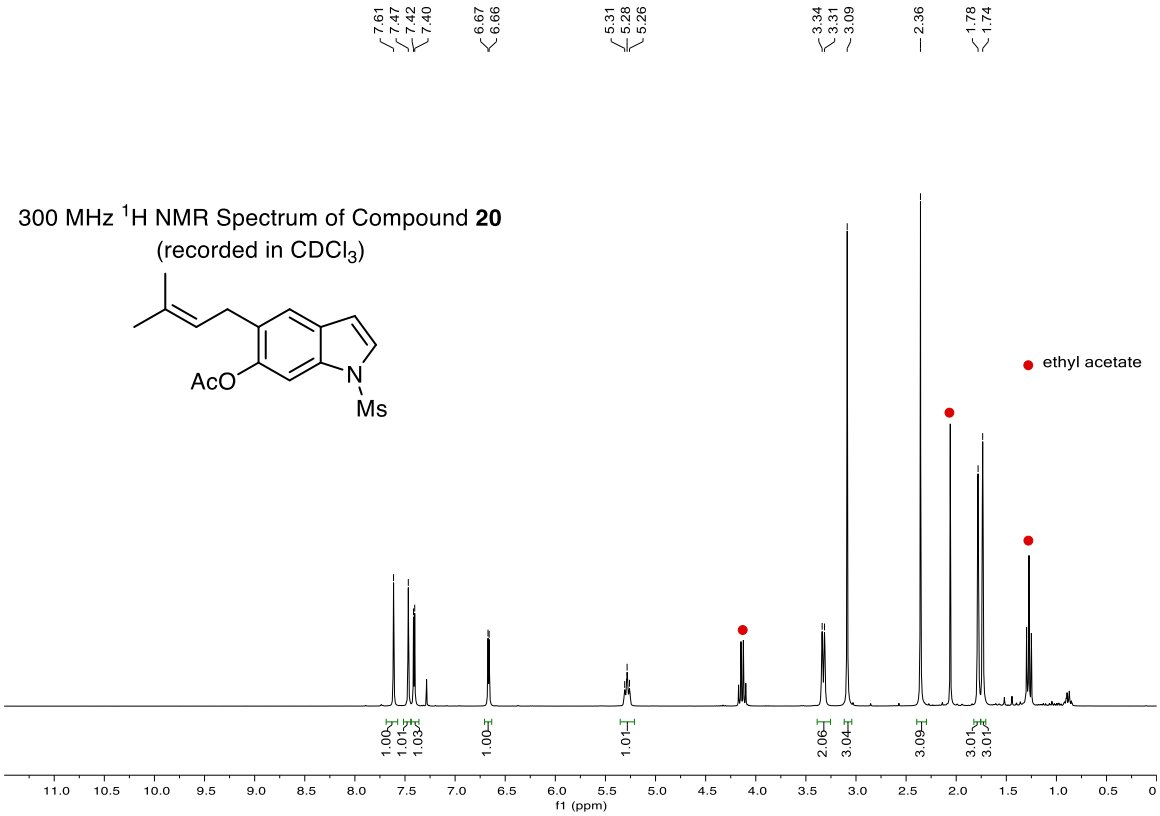


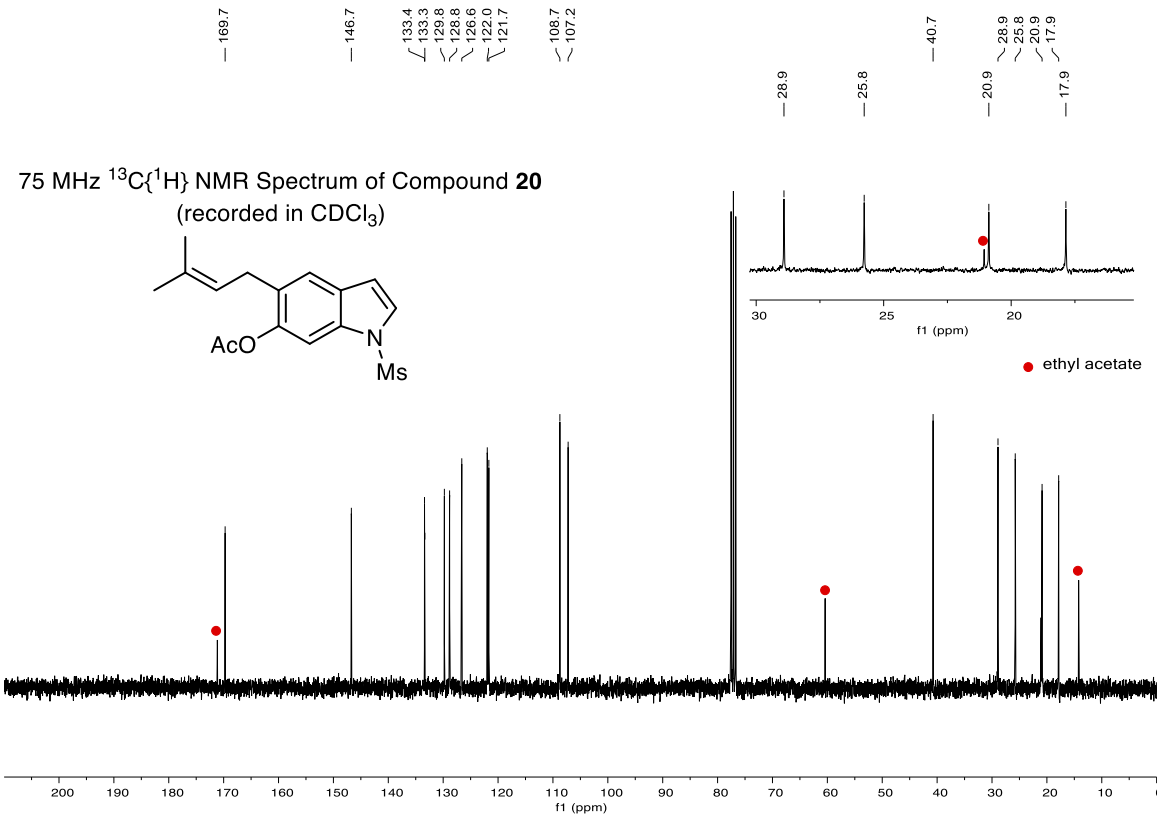
300 MHz ^{1}H NMR Spectrum of Compound **S4**
(recorded in $CDCl_3$)



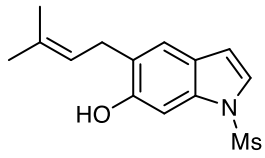
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **S4**
(recorded in $CDCl_3$)



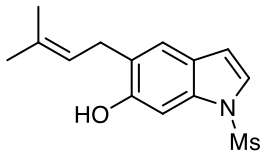

7.61
7.47
7.42
7.40
6.67
6.66
5.31
5.28
5.26
3.34
3.31
3.09
2.36
1.78
1.74
300 MHz ^{1}H NMR Spectrum of Compound **20**
(recorded in $CDCl_3$)
AcO
N
Ms
ethyl acetate
1.00
1.01
1.03
1.00
1.01
2.06
3.04
3.09
3.01
3.01
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
f1 (ppm)


169.7
146.7
133.4
133.3
129.8
128.8
126.6
122.0
121.7
108.7
107.2
40.7
28.9
25.8
20.9
17.9
28.9
25.8
20.9
17.9
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **20**
(recorded in $CDCl_3$)
AcO
N
Ms
30 25 20
f1 (ppm)
ethyl acetate
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

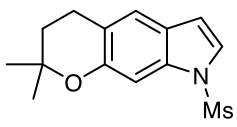
300 MHz ^{1}H NMR Spectrum of Compound **21**
(recorded in $CDCl_3$)



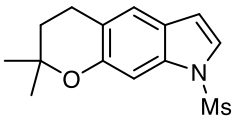
75 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **21**
(recorded in $CDCl_3$)



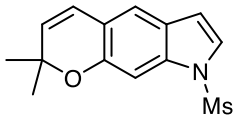
300 MHz ^{1}H NMR Spectrum of Compound **22**
(recorded in $CDCl_3$)



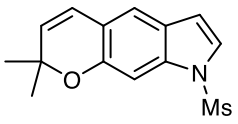
75 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **22**
(recorded in $CDCl_3$)



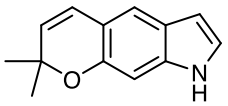
300 MHz ^{1}H NMR Spectrum of Compound **23**
(recorded in $CDCl_3$)



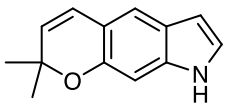
75 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **23**
(recorded in $CDCl_3$)



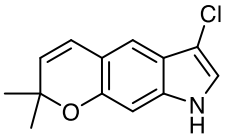
500 MHz ^{1}H NMR Spectrum of Compound **24**
(recorded in DMSO-d_6)



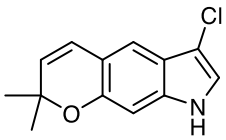
126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **24**
(recorded in DMSO-d_6)



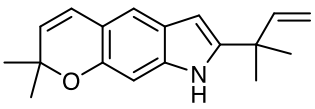
300 MHz ^{1}H NMR Spectrum of Compound **S5**
(recorded in DMSO-d_6)



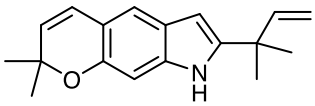
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **S5**
(recorded in DMSO-d_6)



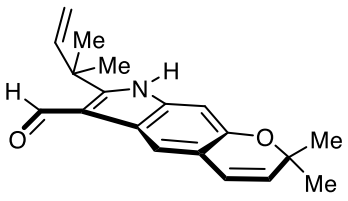
300 MHz ^{1}H NMR Spectrum of Compound **25**
(recorded in DMSO-d_6)



75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **25**
(recorded in DMSO-d_6)

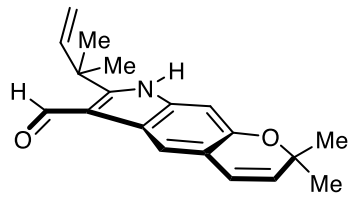


300 MHz ^{1}H NMR Spectrum of Compound **11**
(recorded in DMSO-d_6)

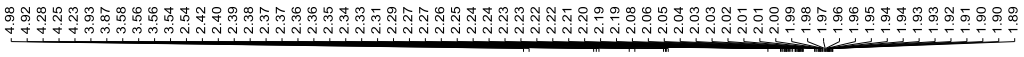


asperversiamide J

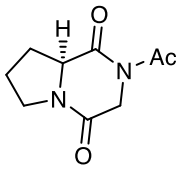
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **11**
(recorded in DMSO-d_6)

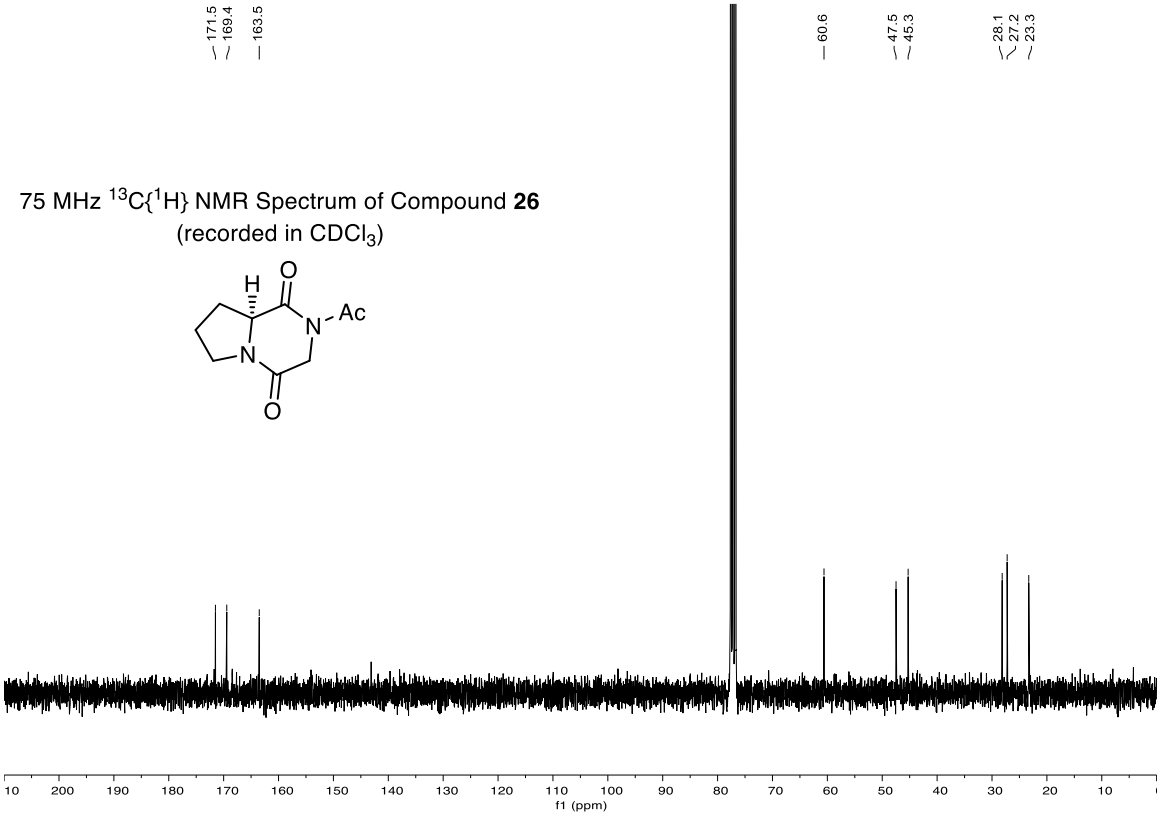


asperversiamide J



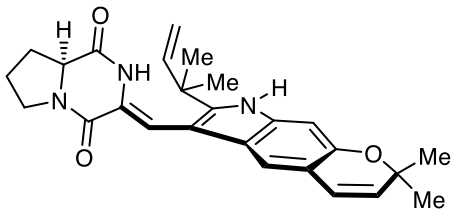
300 MHz ^{1}H NMR Spectrum of Compound **26**
(recorded in $CDCl_3$)





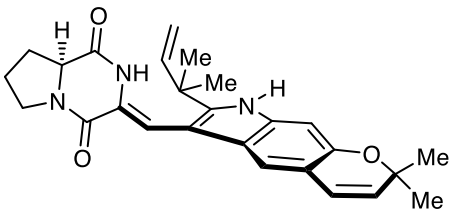
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **26**
(recorded in $CDCl_3$)

500 MHz ^{1}H NMR Spectrum of Compound **8**
(recorded in methanol-d_4)



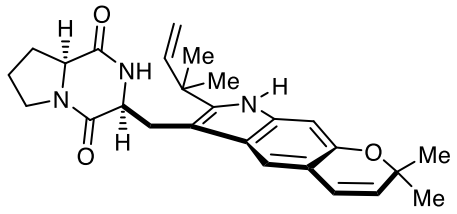
asperversiamide G

126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **8**
(recorded in methanol-d_4)



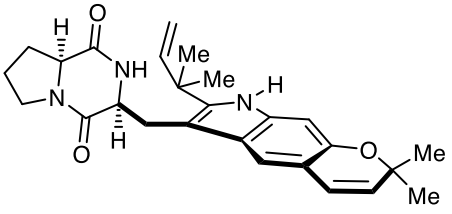
asperversiamide G

600 MHz ^{1}H NMR Spectrum of Compound **6**
(recorded in methanol-d_4)



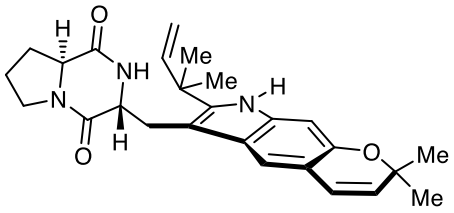
dihydrocarneamide A

151 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **6**
(recorded in methanol-d_4)



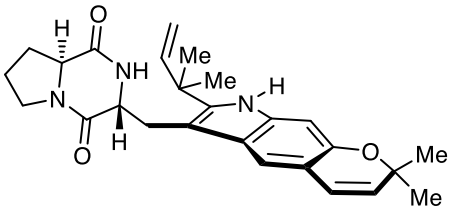
dihydrocarneamide A

600 MHz ^{1}H NMR Spectrum of Compound *ent*-**7**
(recorded in methanol-d_4)

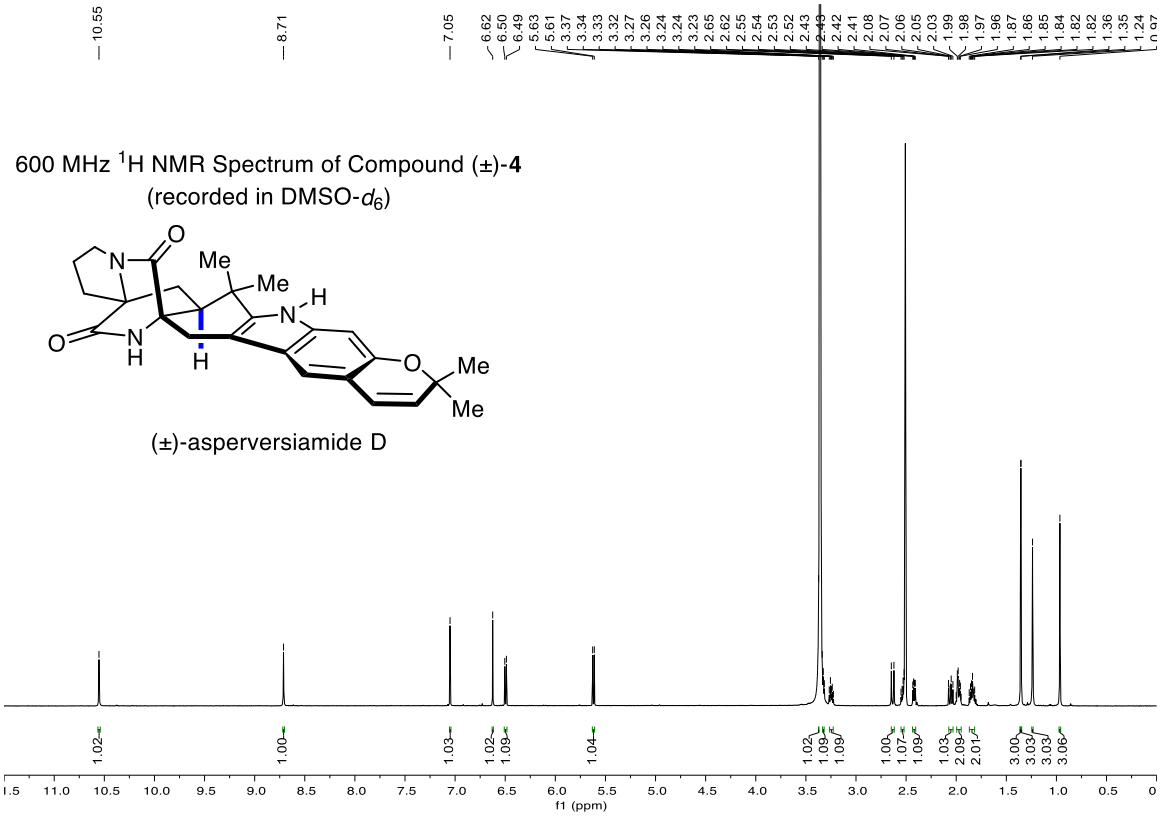


ent-asperversiamide F

151 MHz ^{13}C{^{1}H} NMR Spectrum of Compound *ent*-**7**
(recorded in methanol-d_4)

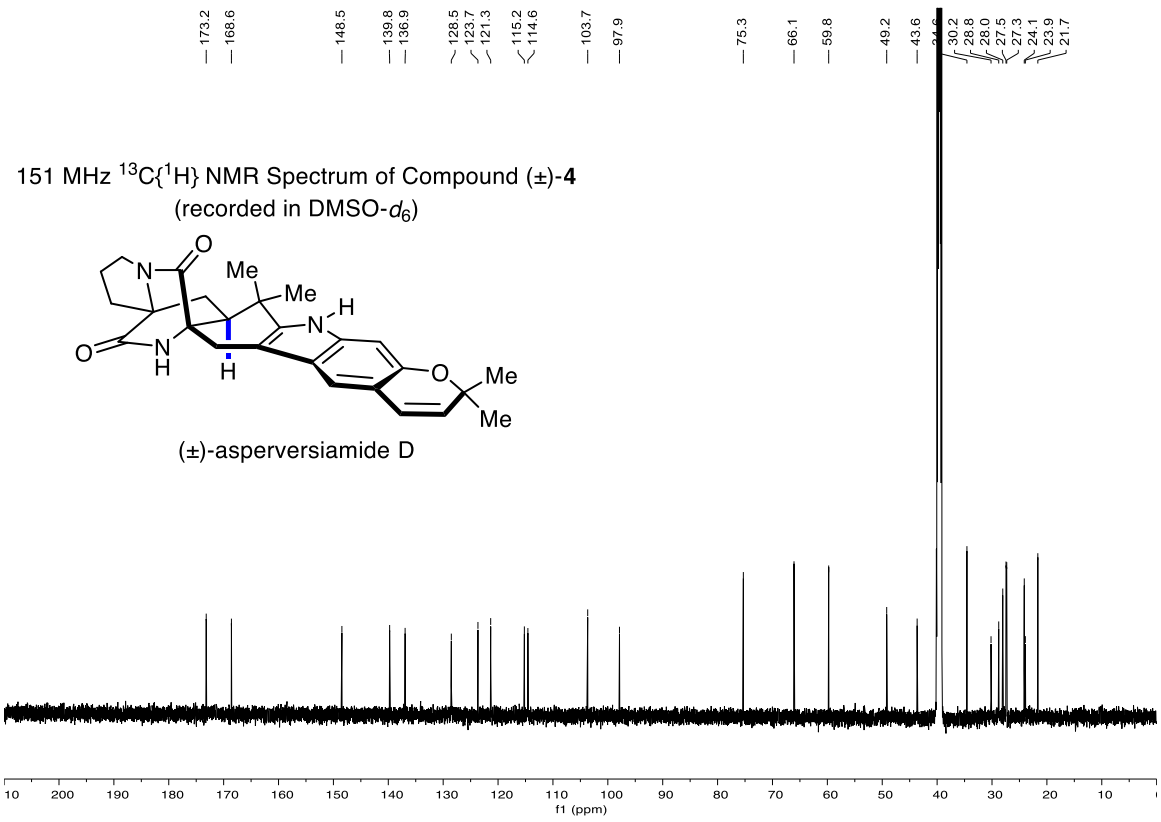


ent-asperversiamide F



600 MHz ^{1}H NMR Spectrum of Compound (±)-**4**
(recorded in DMSO-d_6)

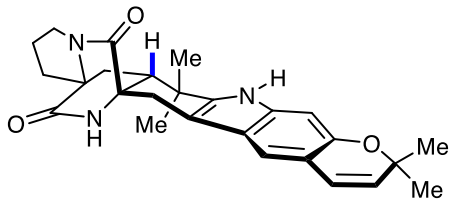
(±)-asperversiamide D



151 MHz ^{13}C{^{1}H} NMR Spectrum of Compound (±)-**4**
(recorded in DMSO-d_6)

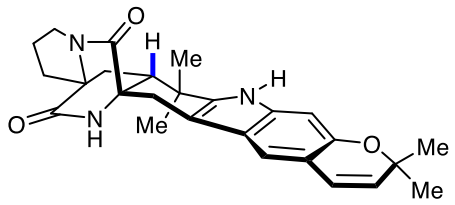
(±)-asperversiamide D

500 MHz ^{1}H NMR Spectrum of Compound (±)-**5**
(recorded in DMSO-d_6)

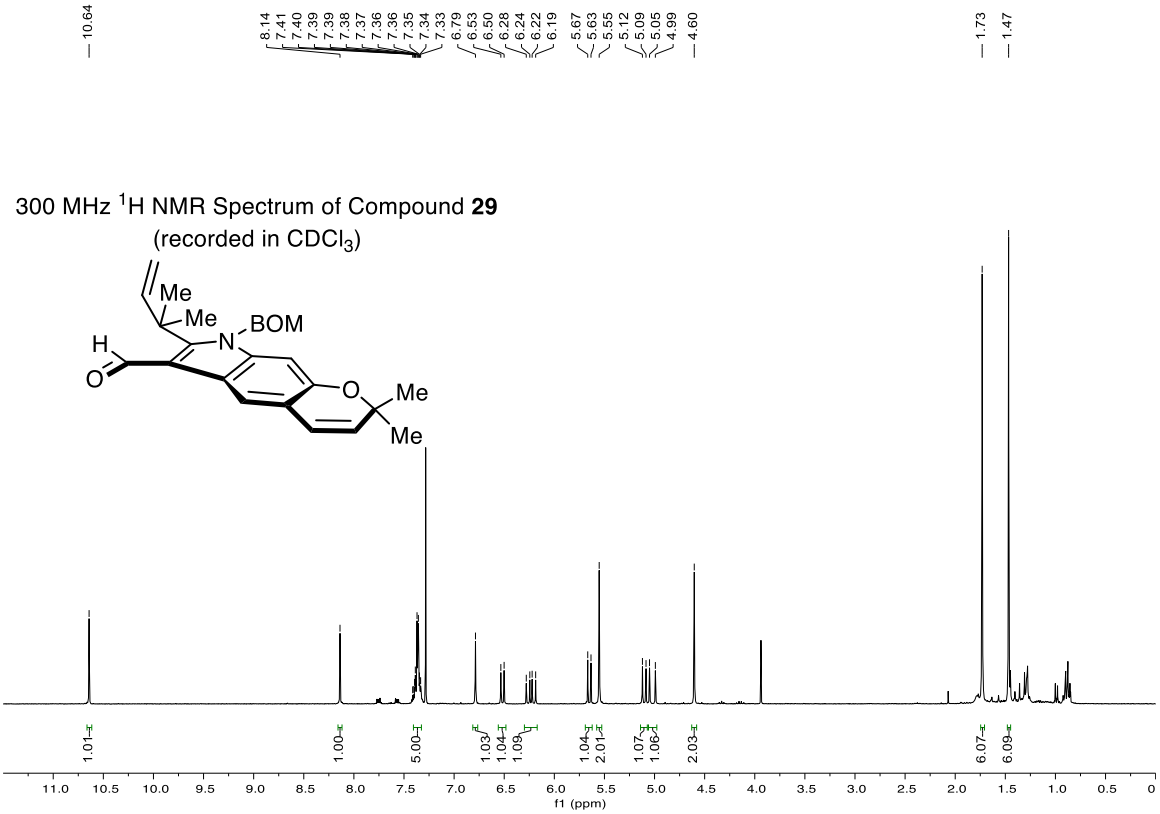


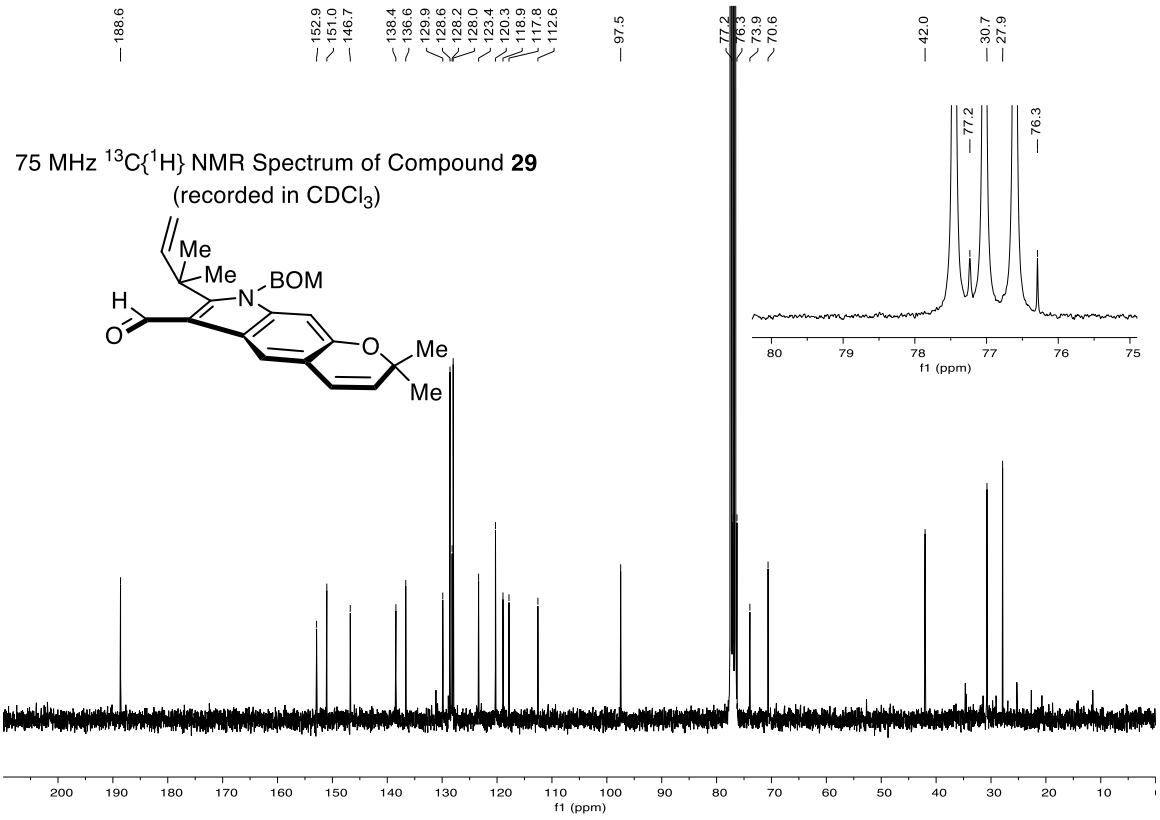
(±)-asperversiamide E

126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound (±)-**5**
(recorded in DMSO-d_6)

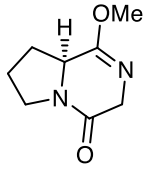


(±)-asperversiamide E

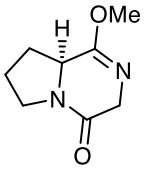

10.64
8.14
7.41
7.40
7.39
7.39
7.38
7.37
7.36
7.36
7.35
7.34
7.33
6.79
6.53
6.50
6.28
6.24
6.22
6.19
5.67
5.63
5.55
5.12
5.09
5.05
4.99
4.60
1.73
1.47
300 MHz ^{1}H NMR Spectrum of Compound **29**
(recorded in $CDCl_3$)
Me
Me
N
BOM
H
O
O
Me
Me
1.01
1.00
5.00
1.03
1.04
1.09
1.04
2.01
1.07
1.06
2.03
6.07
6.09
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
f1 (ppm)


188.6
152.9
151.0
146.7
138.4
136.6
129.9
128.6
128.2
128.0
123.4
120.3
118.9
117.8
112.6
97.5
77.2
76.3
73.9
70.6
42.0
30.7
27.9
77.2
76.3
80 79 78 77 76 75
f1 (ppm)
75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **29**
(recorded in $CDCl_3$)
Me
Me
N
BOM
H
O
O
Me
Me
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

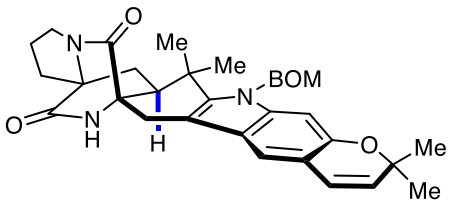
600 MHz ^{1}H NMR Spectrum of Compound **30**
(recorded in DMSO-d_6)



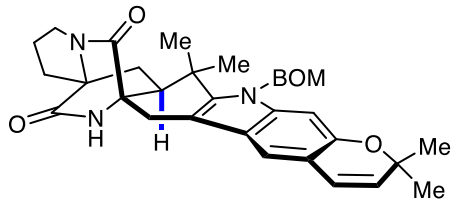
151 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **30**
(recorded in DMSO-d_6)



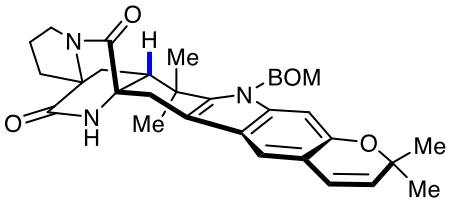
500 MHz ^{1}H NMR Spectrum of Compound (±)-**31**
(recorded in DMSO-d_6)



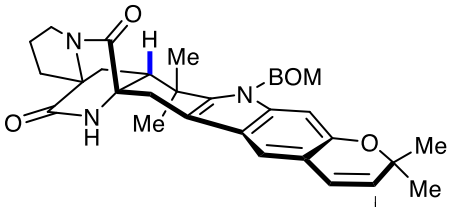
126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound (±)-**31**
(recorded in DMSO-d_6)



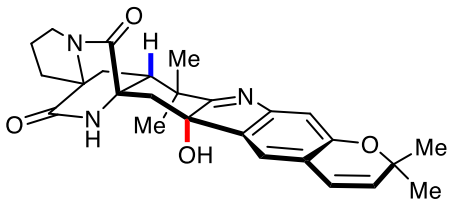
500 MHz ^{1}H NMR Spectrum of Compound (±)-**32**
(recorded in DMSO-d_6)



126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound (±)-**32**
(recorded in DMSO-d_6)

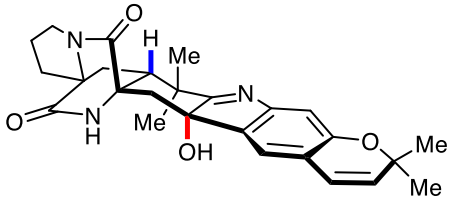


500 MHz ^{1}H NMR Spectrum of Compound (±)-**1**
(recorded in DMSO-d_6)

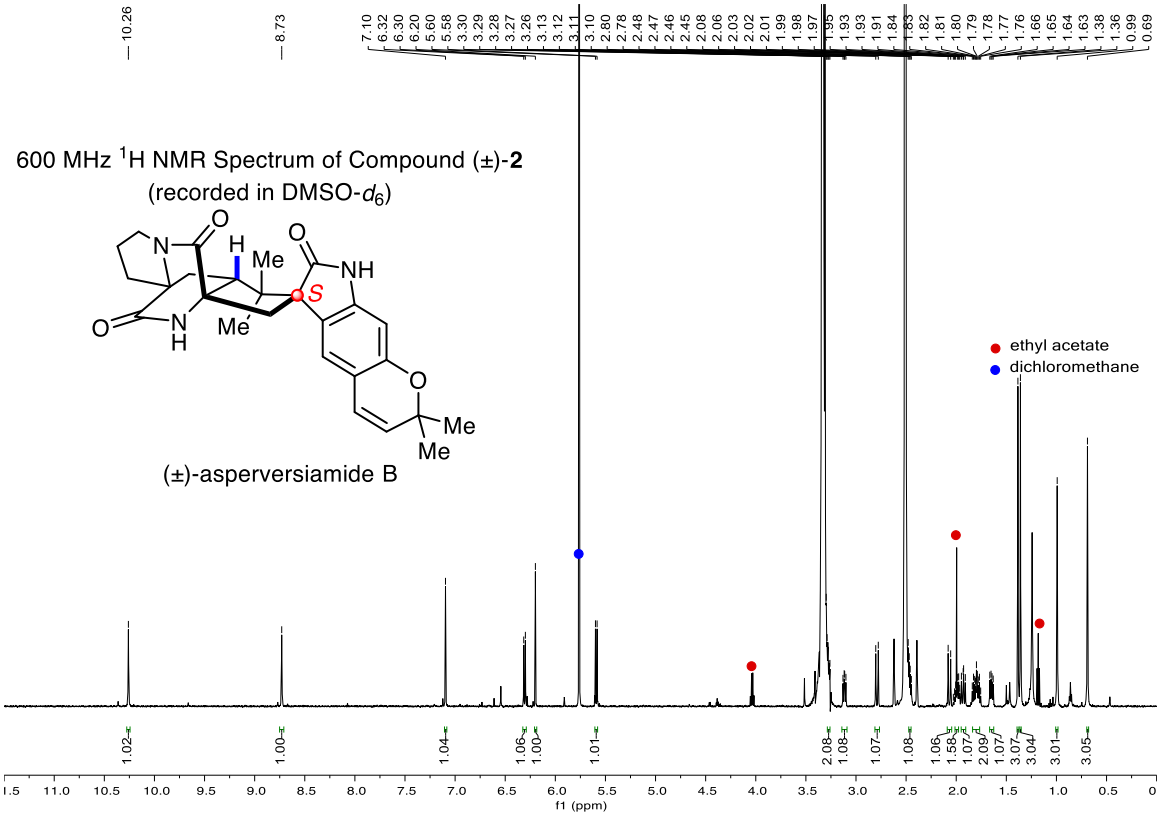


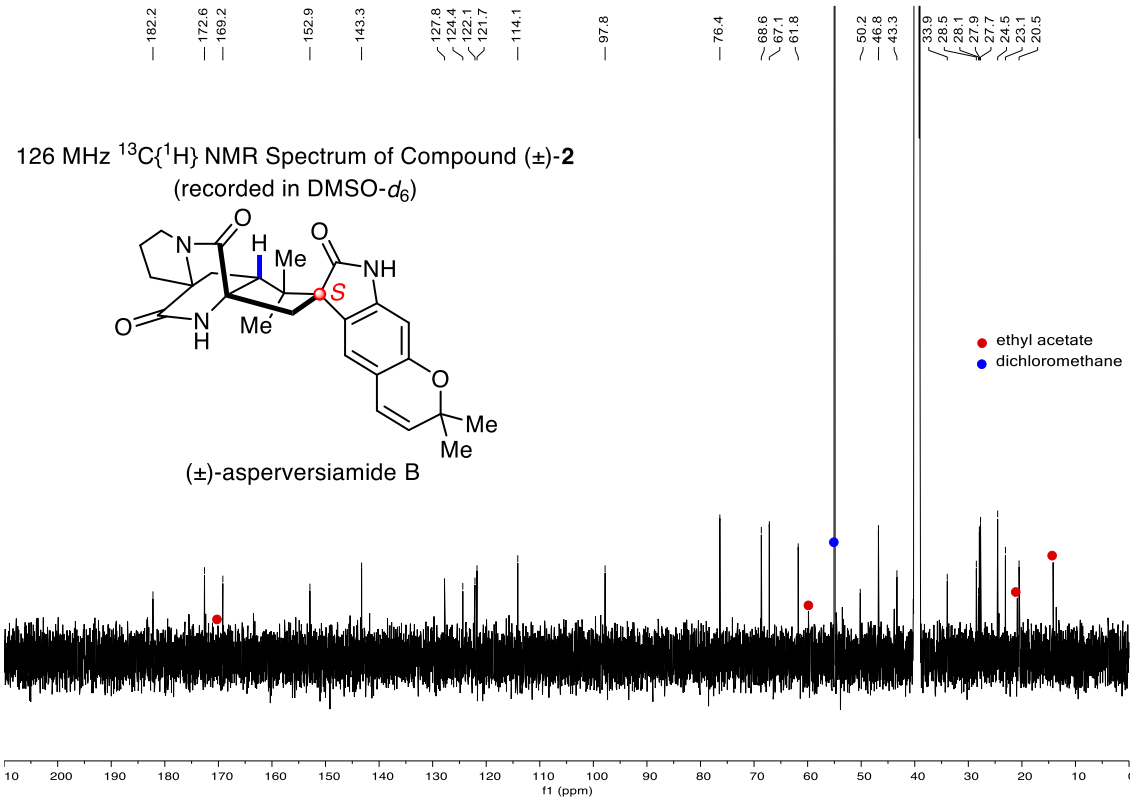
(±)-asperversiamide A

126 MHz ^{13}C NMR Spectrum of Compound (±)-**1**
(recorded in DMSO-d_6)

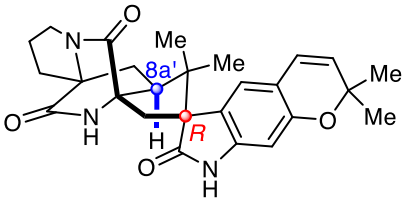


(±)-asperversiamide A


600 MHz ^{1}H NMR Spectrum of Compound (±)-**2**
(recorded in DMSO-d_6)
(±)-asperversiamide B
ethyl acetate
dichloromethane
f1 (ppm)

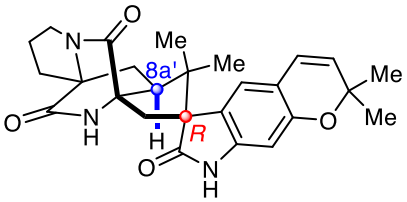

126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound (±)-**2**
(recorded in DMSO-d_6)
(±)-asperversiamide B
ethyl acetate
dichloromethane
f1 (ppm)

500 MHz ^{1}H NMR Spectrum of Compound (±)-**39**
(recorded in DMSO-d_6)



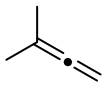
(±)-C8a'-*epi*-Asperversiamide C

126 MHz ^{13}C{^{1}H} NMR Spectrum of Compound (±)-**39**
(recorded in DMSO-d_6)

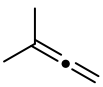


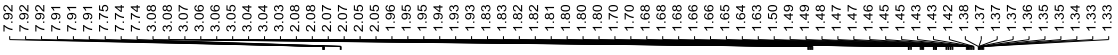
(±)-C8a'-*epi*-Asperversiamide C

300 MHz ^{1}H NMR Spectrum of Compound **S6**
(recorded in DMSO-d_6)

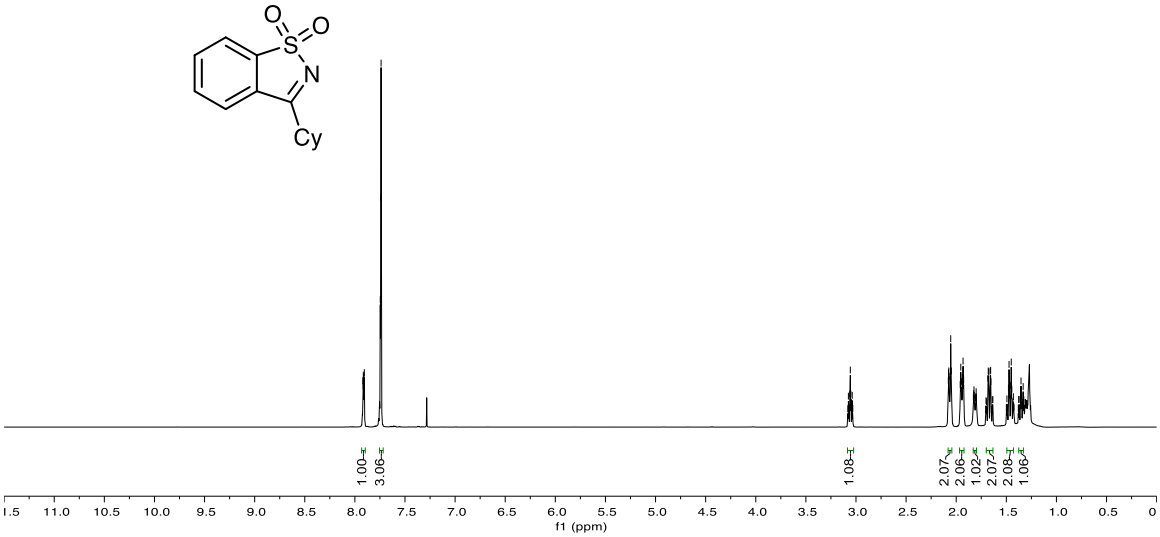


75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **S6**
(recorded in DMSO-d_6)

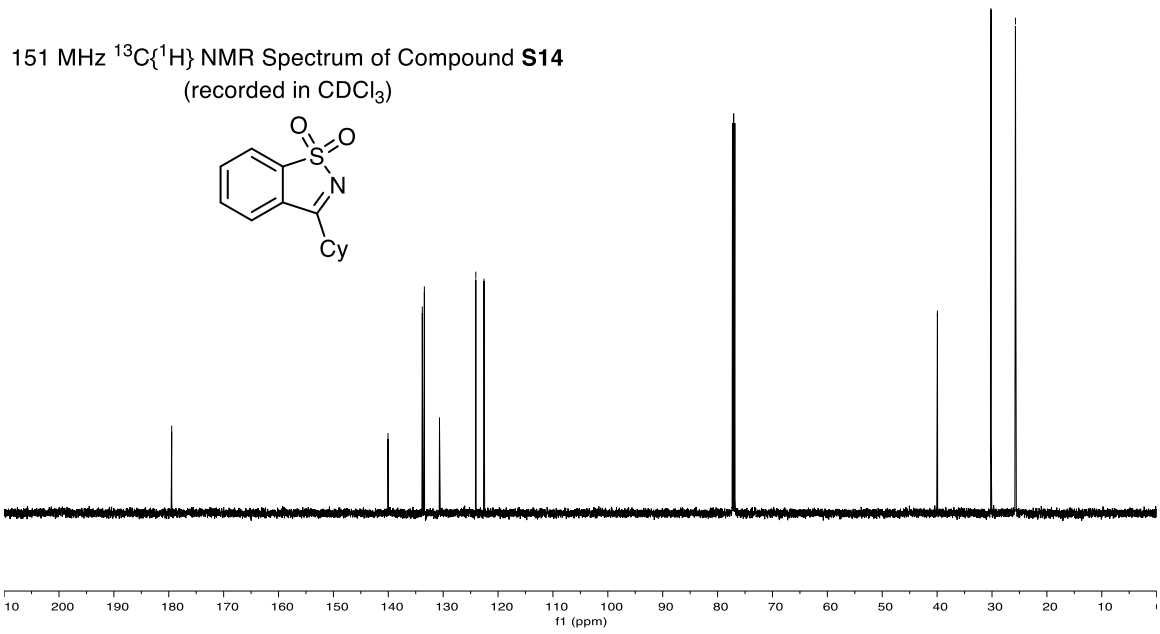




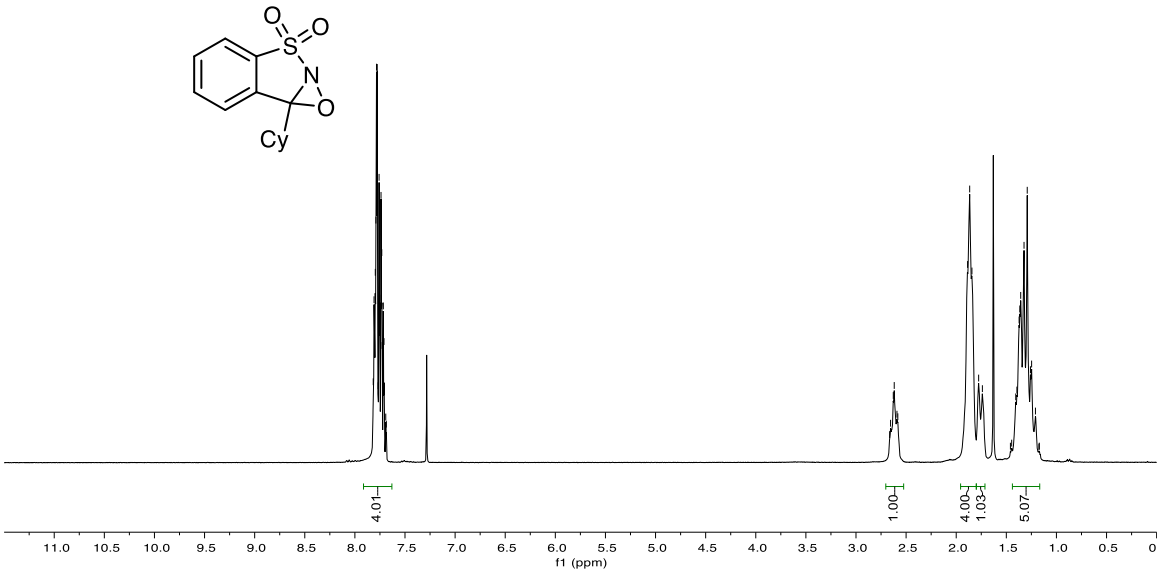
600 MHz ^{1}H NMR Spectrum of Compound **S14**
(recorded in $CDCl_3$)



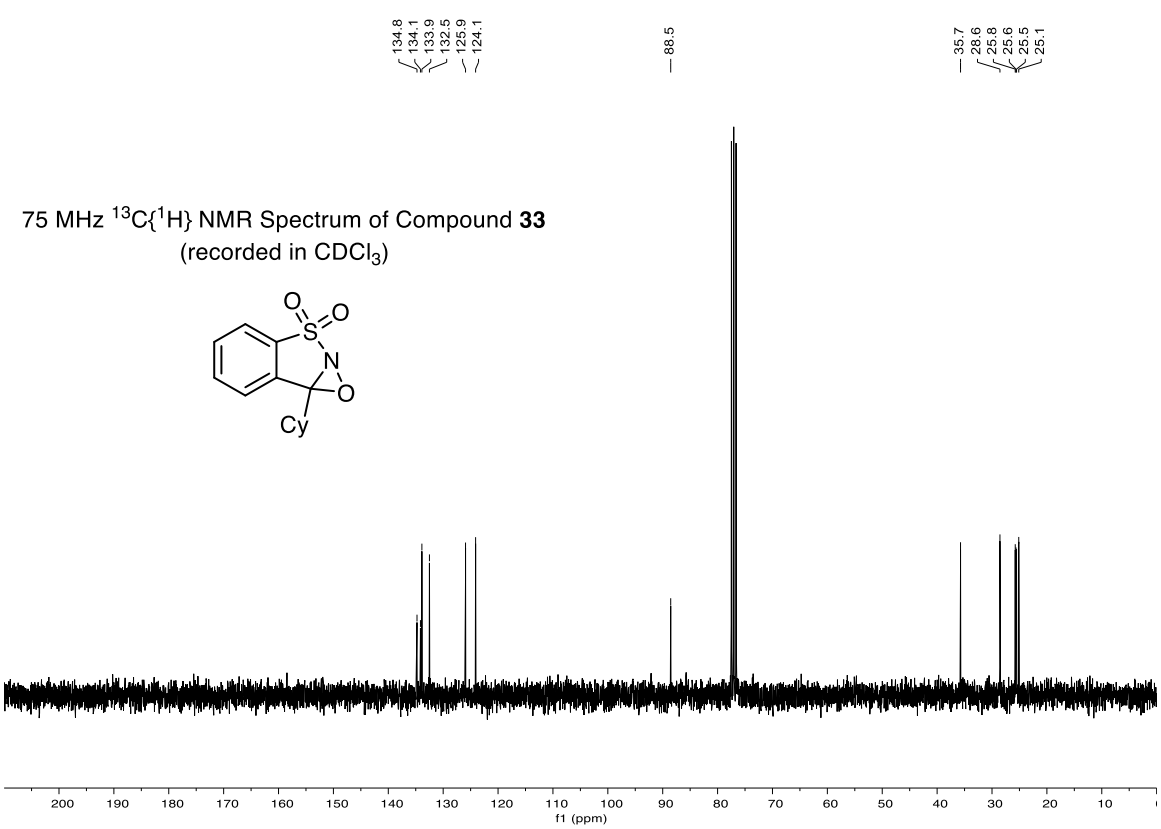
151 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **S14**
(recorded in $CDCl_3$)

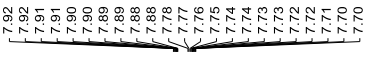


300 MHz ^{1}H NMR Spectrum of Compound **33**
(recorded in $CDCl_3$)

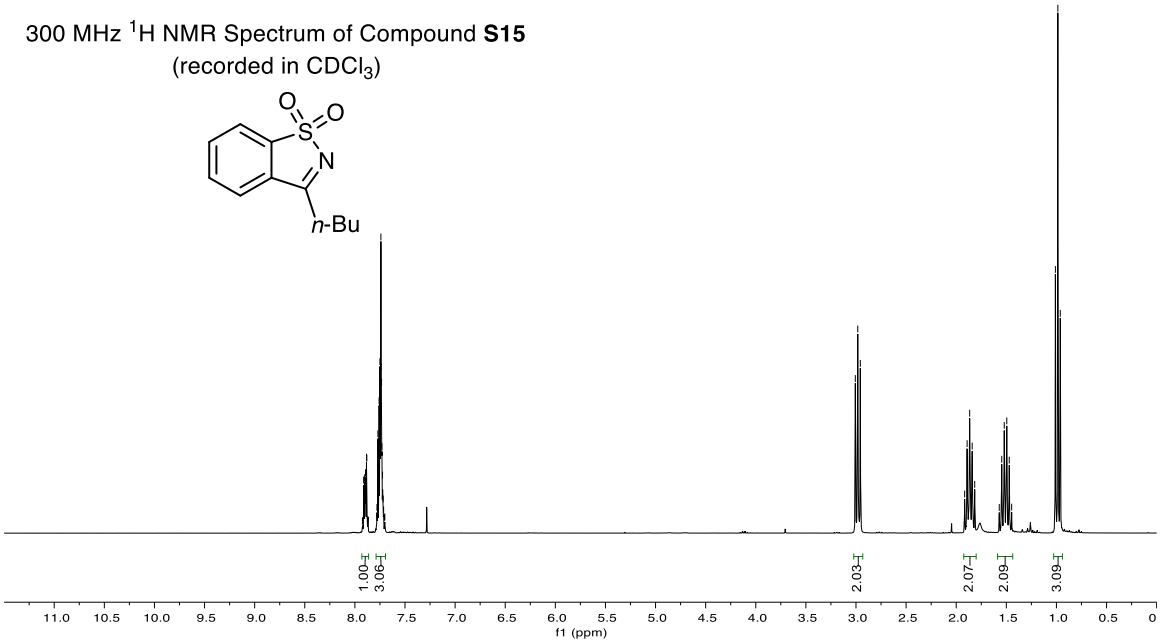


75 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **33**
(recorded in $CDCl_3$)

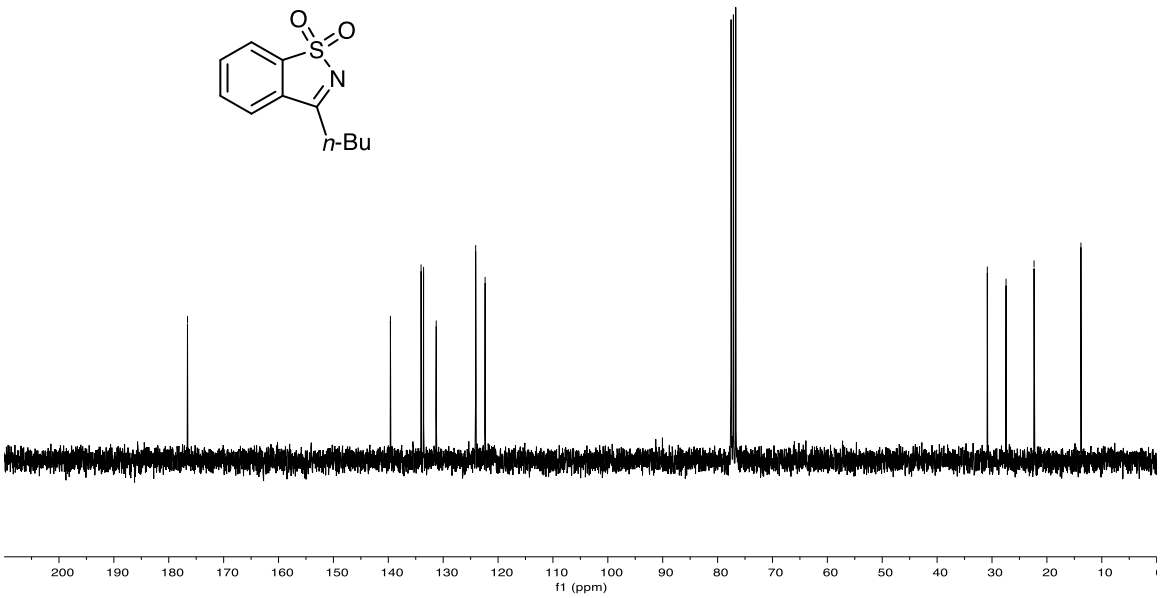


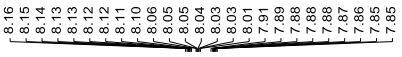


300 MHz ^{1}H NMR Spectrum of Compound **S15**
(recorded in $CDCl_3$)

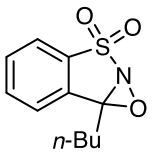


75 MHz $^{13}C\{^{1}H\}$ NMR Spectrum of Compound **S15**
(recorded in $CDCl_3$)

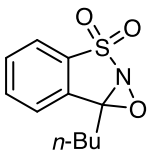




300 MHz ^{1}H NMR Spectrum of Compound **34**
(recorded in DMSO-d_6)

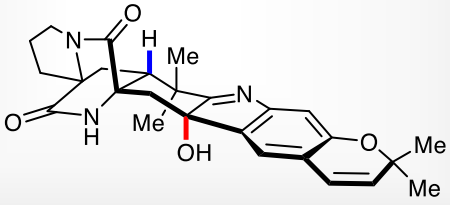


75 MHz ^{13}C{^{1}H} NMR Spectrum of Compound **34**
(recorded in DMSO-d_6)

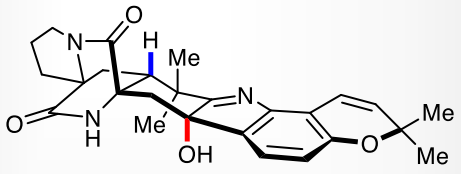


(viii) ^{1}H NMR Spectra Comparison of Synthetic (±)-1, Isolated Natural Products Asperversiamide A, Taichunamide A and H

500 MHz ^{1}H NMR Spectrum of Synthetic (±)-**1**
(recorded in DMSO-d_6)

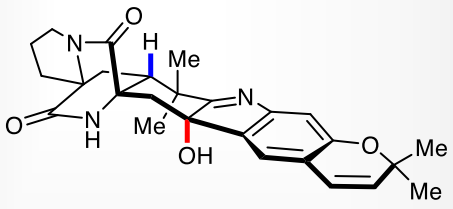


^{1}H NMR Spectrum of Taichunamide A
(recorded in DMSO-d_6)

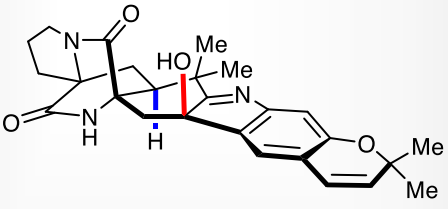


Isolated in **2016**
The spectra copied from
Angew. Chem. Int. Ed. **2016**, *55*, 1128-1132

^{1}H NMR Spectrum of Asperversiamide A
(recorded in DMSO-d_6)

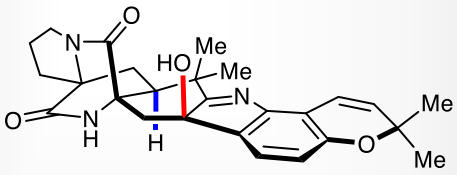


Isolated in **2018**
The spectra copied from
J. Org. Chem. **2018**, *83*, 8483-8492



38
proposed revised
structure for asperversiamide A

^{1}H NMR Spectrum of Taichunamide H
(recorded in DMSO-d_6)



Isolated in **2018** (single crystal data)
The spectra copied from
Org. Lett. **2018**, *20*, 1138-1141.