Supplementary Material (ESI) for Chemical Communications

Electronic Supplementary Information

for

Preparation and X-ray crystal structure of 2-iodyl-*N*,*N*-dialkylaniline oxides: first entry into the heterocyclic system of benziodoxazole

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General Methods and Materials. Melting points were determined in an open capillary tube with a Mel-temp II® melting point apparatus and are uncorrected. Infrared spectra were recorded as a NaCl pellet on a Perkin-Elmer 1600 series FT-IR spectrophotometer. NMR spectra were recorded on a Varian ^{UNITY} INOVA 500 MHz NMR spectrometer at 500 MHz (^{1}H NMR) and 125 MHz (^{13}C NMR). Chemical shifts are reported in parts per million (ppm). ^{1}H and ^{13}C chemical shifts are referenced relative to the tetramethylsilane. GC-MS analysis was carried out with a HP 5890A Gas Chromatograph using a 5970 Series mass selective detector. Mass-spectra were obtained with a Micromass Zabspec oaTOF or PE Biosystems Mariner TOF instrument. Microanalyses were carried out by Atlantic Microlab, Inc., Norcross, Georgia. All commercial reagents were ACS reagent grade and used without further purification. Diethyl ether was freshly distilled from Na/benzophenone. THF was <50 ppm of water dry from ACROS Organics and used without further purification. 3,3-Dimethyldioxirane (as 0.1 M solution in acetone) was prepared from commercial acetone and Oxone (Acros) by a known method [W. Adam, J. Bialas, L. Hadjiarapoglou, *Chem. Ber.* 1991, **124**, 3277]. *N*-(2-Iodophenyl)-*N*-methylpivalamide **8a** and *N*-(2-iodophenyl)-*N*-methylbutyramide **8b** were prepared from 2-iodoaniline as previously described [U. Ladziata, A. Y. Koposov, K. Y. Lo, J. Willging, V. N. Nemykin and V. V. Zhdankin, *Angew. Chem., Int. Ed.*, 2005, **44**, 7127].

2-Iodo-*N*-methyl-*N*-neopentylaniline 9a:

To a solution of *N*-(2-iodophenyl)-*N*-methylpivalamide **8a** (950 mg, 3 mmol) in 20 mL of dry THF, 1.2 mL of 10M solution of $BH_3 \cdot Me_2S$ (12 mmol) in THF was added at 0 °C. After 4 h stirring the mixture was treated with 10 mL of 2M aqueous NaOH. THF was removed *in vacuo* and 50 mL of water was added to the residue. The mixture was extracted with EtOAc (3x20 mL) and the combined extracts were dried over Na_2SO_4. The solvent was evaporated under reduced pressure and the residue was purified by flash chromatography (hexane-EtOAc 10:1) to yield a colorless oil (850 mg, 94%). ^{1}H NMR

($CDCl_3$): δ 7.88 (dd, J = 7.8 Hz, J = 1.4 Hz, 1H), 7.32 (ddd, J = 8.3 Hz, J = 8.3 Hz, J = 1.2 Hz, 1H), 7.26 (dd, J =6.3 Hz, J = 1.7 Hz, 1 H), 6.79 (ddd, J = 7.3 Hz, J = 7.6 Hz, J = 1.7 Hz, 1H), 2.96 (s, 2H), 2.79 (s, 3H), 0.94 (s, 9H). ^{13}C NMR ($CDCl_3$): δ 157.1, 140.2, 129.4, 125.6, 124.7, 101.3, 68.6, 48.5, 34.5, 28.4.

2-Iodo-*N*-methyl-*N*-butylaniline 9b:

To a solution of *N*-(2-iodophenyl)-*N*-methylbutyramide **8b** (6.34 g, 20 mmol) in 150 mL of dry THF, 8 mL of 10M solution of $BH_3 \cdot Me_2S$ (8 mmol) in THF was added at 0 ºC. After 4 h stirring the mixture was treated with 25 mL of 2M NaOH. THF was removed *in vacuo* and 100 mL of water was added to residue. The mixture was extracted with EtOAc (3x50 mL) and the combined extracts were dried over Na_2SO_4. The solvent was evaporated under reduced pressure and the residue was purified by flash chromatography (hexane-EtOAc 10:1) to yield a colorless oil (5.82 g, 96%). ^{1}H NMR ($CDCl_3$): δ 7.77 (dd, J = 7.8 Hz, J = 1.4 Hz, 1H), 7.22 (ddd, J = 8.0 Hz, J = 8.0 Hz, J = 1.2 Hz, 1H), 7.00 (dd, J =7.0 Hz, J = 1.7 Hz, 1 H), 6.69 (ddd, J = 7.5 Hz, J = 7.6 Hz, J = 1.7 Hz, 1H), 2.85 (m, 2H), 2.62 (s, 2H), 1.44 (q, J = 7.5 Hz, 2H), 1.28 (sextet, J = 7.5 Hz, 2H), 0.83 (t, J = 7.5 Hz, 3H). High resolution ESI-MS: m/z 290.0400 (100%) ($[M+H]^+$ $C_{11}H_{17}IN$ requires 290.0406).

General procedure for oxidation of 2-iodolanilines 9: A freshly prepared 0.1M solution of dimethyldioxirane in acetone (80 mL, 8.0 mmol) was added to a stirred mixture of the appropriate 2-iodolaniline derivative **9** (2.0 mmol) in 5 mL of dry CH_2Cl_2 at 0 ºC. The reaction mixture was stirred at room temperature for 8 h. The resulting solution was evaporated until about 10 mL of acetone left, and then ether was added resulting in the formation of a white microcrystalline precipitate. The precipitate was collected by filtration, washed with ether and dried in vacuum to afford analytically pure products **5**.

2-Iodyl-*N*-methyl-*N*-neopentylaniline oxide 5a

The oxidation of *N*-neopentyl-*N*-methyl-2-iodylaniline **9a** (850 mg, 2.8 mmol) according to the general procedure afforded 850 mg (86%) of product **5a**, isolated as white crystals, mp 149-152 °C (with decomposition). IR (NaCl): 2959, 1656, 1468, 1369, 746 cm^{-1}; ^1H NMR (DMSO-d_6): δ 8.27 (dd, J = 7.5 Hz, J = 1.5 Hz, 1H), 7.97 (d, J = 7.8, 1H), 7.76 (dd, J = 7.5 Hz, J=7.5 Hz, 1H), 7.67 (dd, J = 7.5 Hz, J = 7.8 Hz, 1H), 4.04 (d, J = 13.5 Hz, 1H), 3.57 (d, J = 13.5, 1H), 3.49 (s, 3H), 0.80 (s, 9H). ^{13}C NMR (DMSO-d_6): δ 148.5, 137.8, 132.6, 130.5, 126.0, 79.2, 66.5, 33.5, 30.0.

2-Iodyl-*N*-methyl-*N*-butylanilineoxide 5b

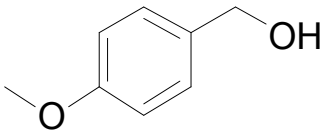
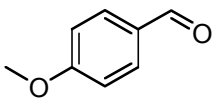
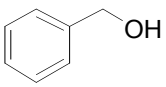
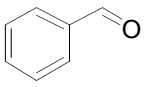
Oxidation of *N*-butyl-*N*-methyl-2-iodylaniline **9b** (600 mg, 2 mmol) according to the general procedure afforded 650 mg (93%) of product **5b**, isolated as white crystals, mp 134-135 °C (with decomposition). IR (NaCl): 2978, 1654, 1466, 1365, 769, 733 cm^{-1}; ^1H NMR (DMSO-d_6): δ 8.31 (d, J = 6.5 Hz, 1H), 7.96 (d, J = 7.8, 1H), 7.77 (m, 2H), 4.00 (m, 1H), 3.56 (m, 4H), 1.78 (m, 1H), 1.20 (m, 2H), 1.07 (m, 1H), 0.81 (t, J = 7.0 Hz, 3H). ^{13}C NMR (DMSO-d_6): δ 147.0, 139.1, 133.2, 130.5, 125.9, 121.8, 71.5, 62.5, 25.3, 19.8, 14.4. High resolution ESI-MS: m/z 338.0217 (10%) ($[M+H]^+$ $C_{11}H_{17}INO_3$ requires 338.0253), 360.0038 (9%) ($[M+Na]^+$ $C_{11}H_{16}INNaO_3$ requires 360.0073), 675.0426 (10%) ($[2M+H]^+$ $C_{22}H_{33}I_2N_2O_6$ requires 675.0433), 697.0266 (100%) ($[2M+Na]^+$ $C_{22}H_{32}I_2N_2NaO_6$ requires 697.0253).

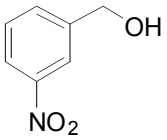
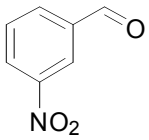
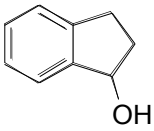
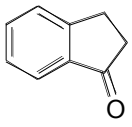
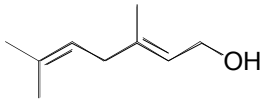
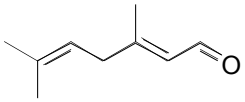
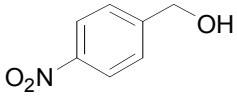
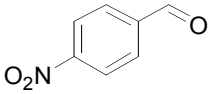
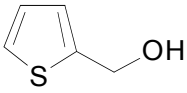
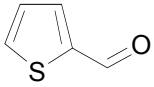
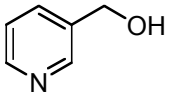
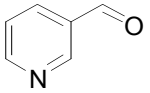
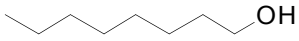
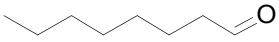
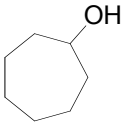
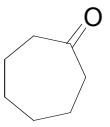
Single crystals of product **5b** suitable for X-ray crystallographic analysis were obtained by slow evaporation of the solution of **5b** in acetone. X-ray diffraction data were collected on Rigaku AFC-7R diffractometrer using graphite-monochromated MoKα radiation (λ = 0.71073 Å) at 298 K. Psi-scan absorption corrections were applied to the data using TeXsan 10.3b program (Rigaku Inc. 1997). The structure was solved by direct methods (SIR-92) and refined by full-matrix least-squares refinement on F^2 using Crystals for Windows program. Crystal data for **5b**. $C_{11}H_{16}INO_3$: M = 337.15, triclinic, space group P-1, a = 8.1788(16), b = 10.512(2), c = 15.850(3) Å, a = 71.58(3)°, β = 82.16(3)°, γ = 78.02(3)°, V

= 1261.1(5) Å^3, Z = 4, μ(Mo Kα) = 2.532 mm^{-1}, T = 298 K, 4478 reflections measured, 4429 unique; final R_1 = 0.0698 ($I \geq 2\sigma(I)$); R_w = 0.0886 ($I \geq 2\sigma(I)$); R_{int} = 0.00. The butyl substituents in independent molecules A and B are positionally disordered over several sites. Our attempts to improve the structure quality by solving such a positional disorder did not lead to improvement of overallquality of the structure. As a result, several reported C-C bonds are slightly shorter as expected for regular C-C bond distances. In addition, several thermal parameters in butyl substituents are also outside the expected range. CCDC-696745 contains the supplementary crystallographic data for compound **5b**. These data can be obtained free of charge via www.ccdc.cam.ac.uk/conts/retrieving.html (or from Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge CB2 1EZ UK; fax: (+44) 1223-336-033, or deposit@ccdc.cam.ac.uk).

General procedure for oxidation of alcohol using compound 5b. To a vigorously stirred solution of reagent **5b** (0.6 mmol) and 50 μL of trifluoroacetic acid in acetone (2 mL) the appropriate alcohol (0.5 mmol) was added. The reaction mixture was monitored by TLC. A portion of the crude reaction mixture (0.1 mL) was passed through 1 cm of silica gel suspended in a pasteur pipet and washed with the mixture of hexane and ethyl acetate 3:2 (2 mL). The resulting solution was analyzed by GC-MS.

Table. Oxidation of alcohols to the respective carbonyl compounds with **5b**.[a]

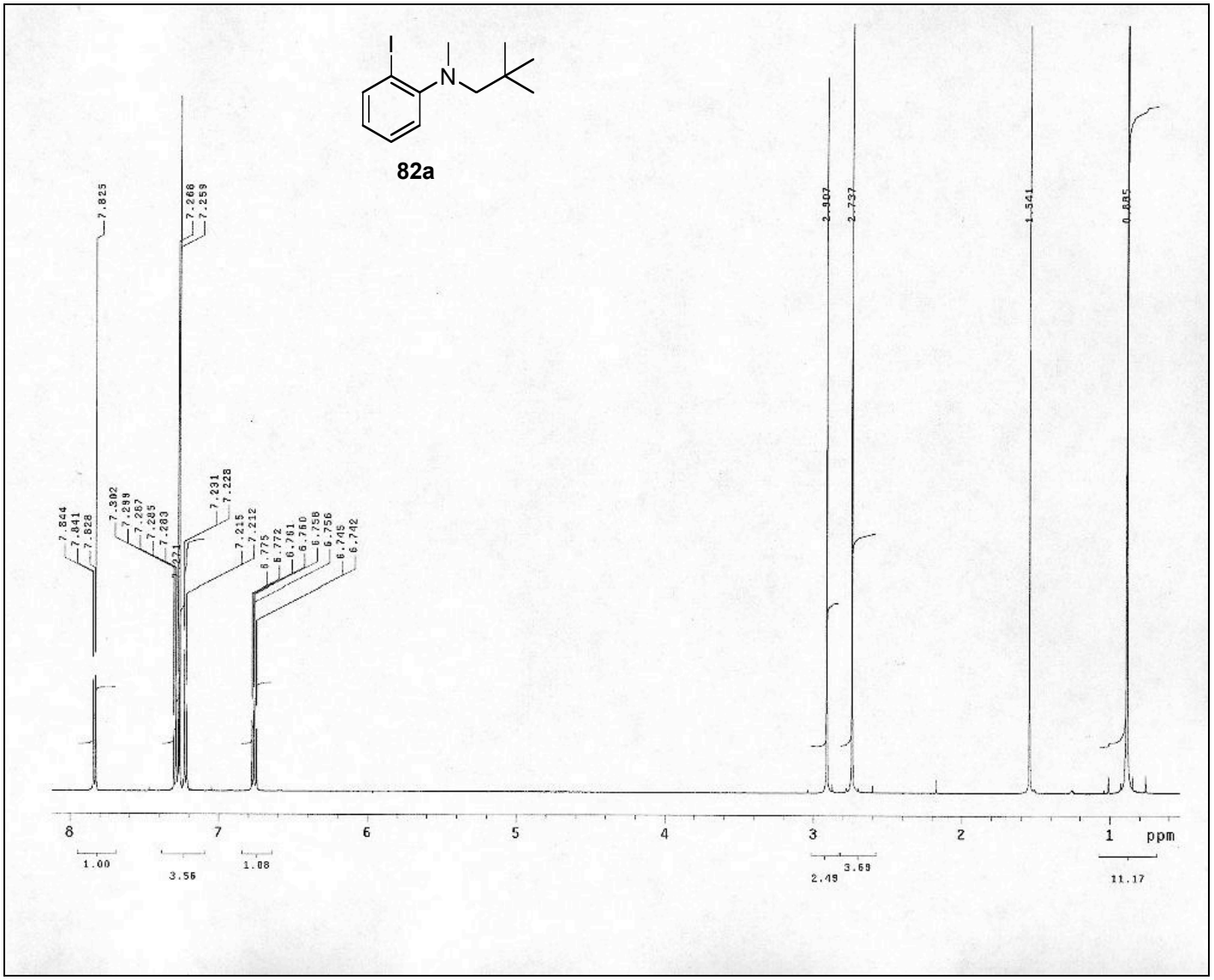
Entry	Substrate	Product	Conversion (%)	Time (h)
1			>98	2.5
2			>98	3

3			>98	4
4			>98	4
5			>98[b]	4.5
6			>98	1.5
7			>98	4.5
8			>98	3
9			82	12
10			90	12

[a] All oxidations were carried out at room temperature in 2 mL ACS grade acetone with 0.6 mmol of reagent **5b,** 0.5 mmol of appropriate alcohol and 50 μL of trifluoroacetic acid. Excess of reagent **5b** was removed by flash chromatography and obtained solution was analyzed by GC-MS. [b] Mixture of a *E*- and *Z*- isomers.

NMR spectra

^{1}H NMR of product **9a** in $CDCl_3$



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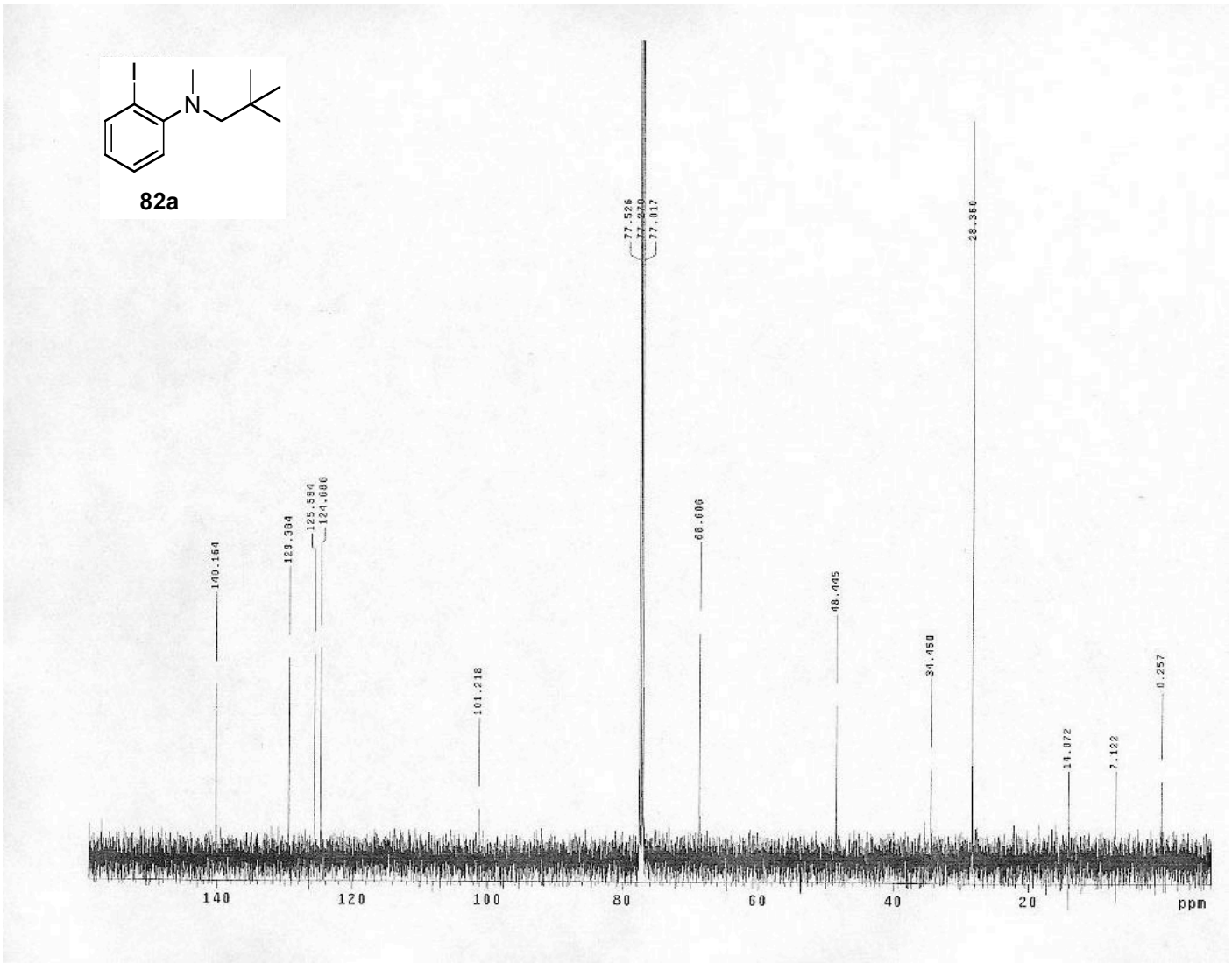

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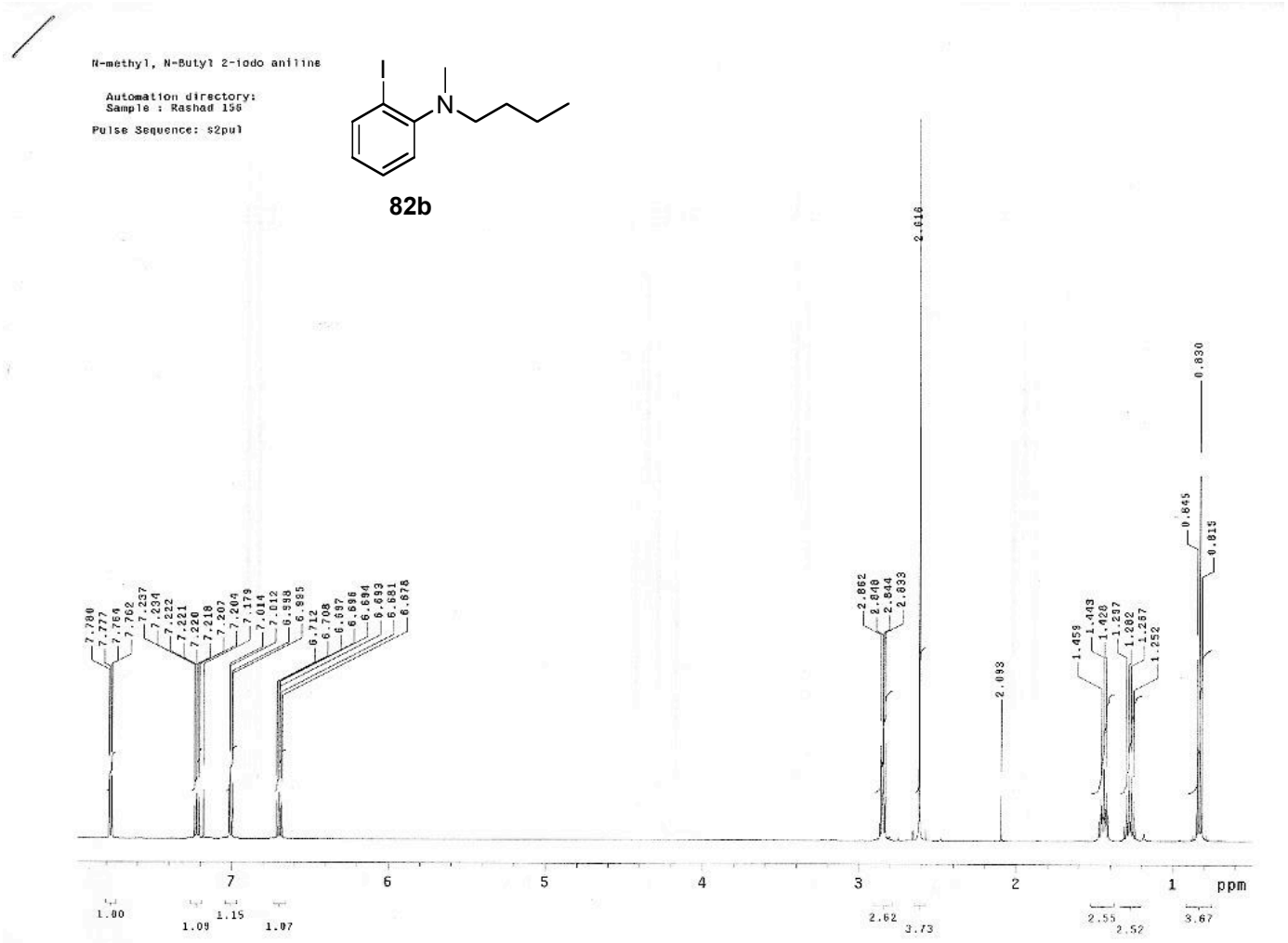
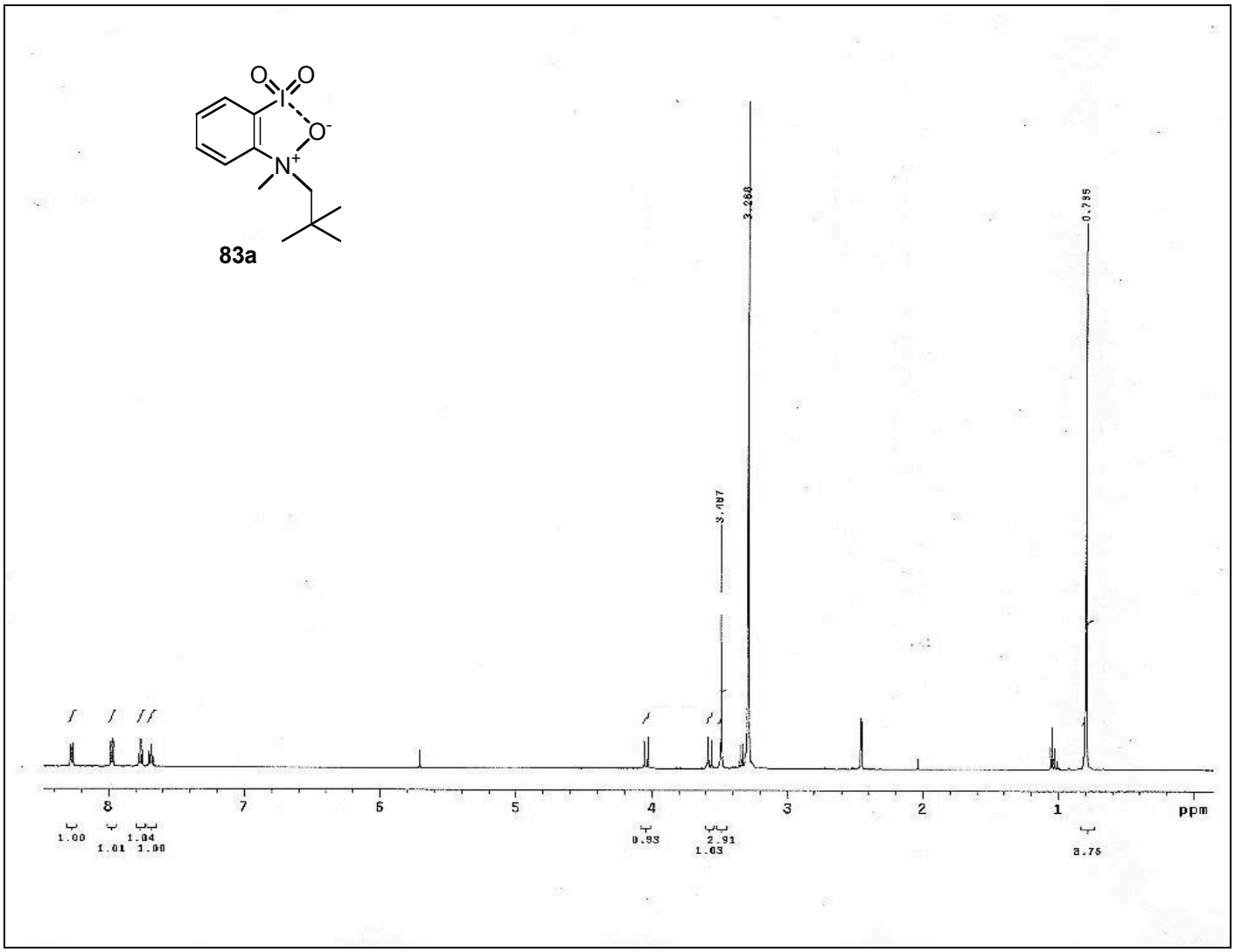


^{1}H NMR of product **5a** in DMSO



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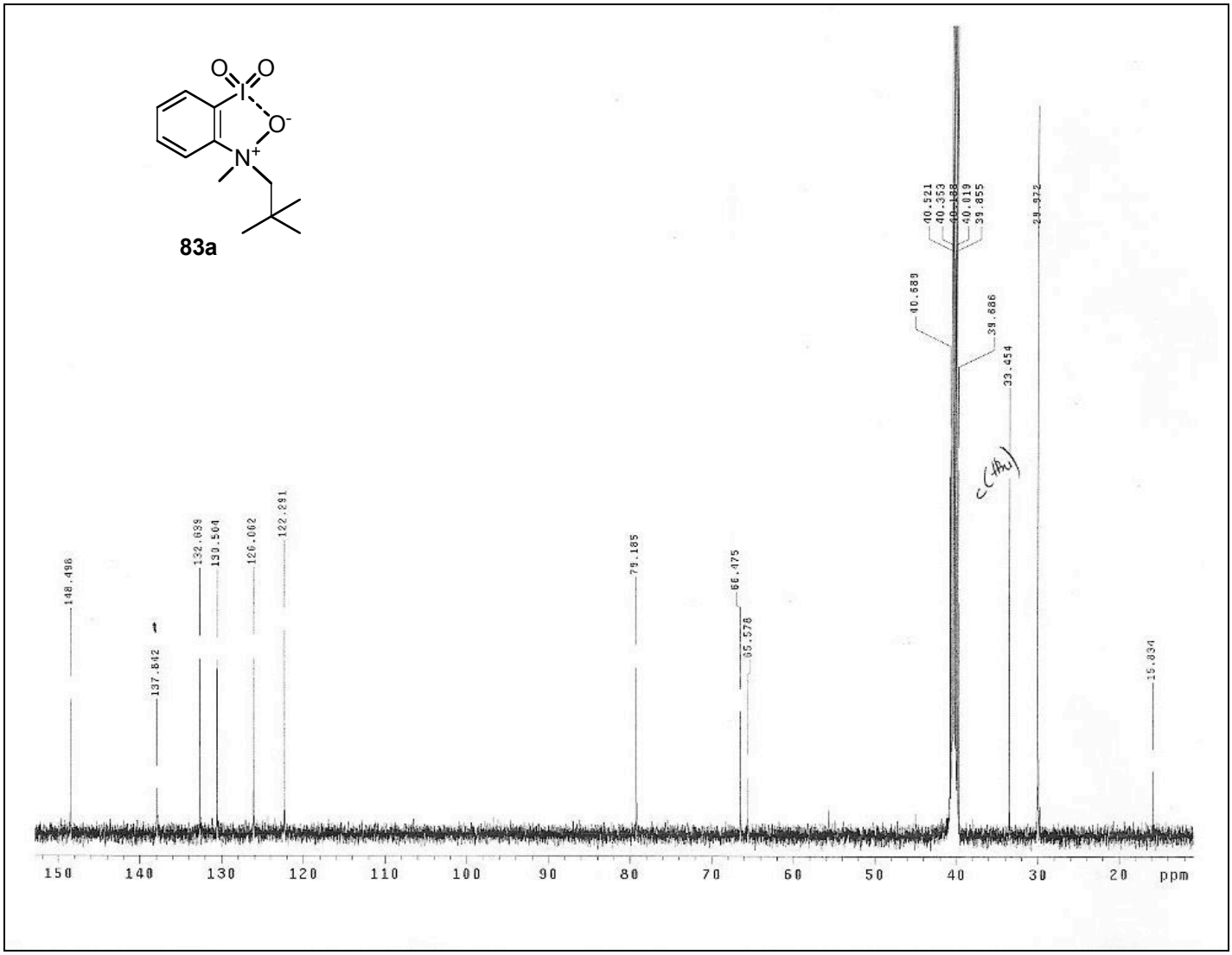

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