Electronic Supplementary Information for Dalton Transactions

Enhancement of Gold(III) Salt Utilization in Activation Alkenes by Addition of $CuCl_2$

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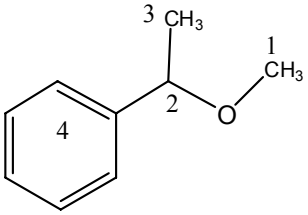
GC/MS and ^{1}H-NMR Analysis

GC/MS analyses were performed on a Agilent 5973N spectrometer equipped with the same column and in the same conditions as GC.

Flash column chromatograph was performed over silica gel (0.04−0.06 mm, Scharlau) using the mixtures of hexane and ethyl acetate (hexane/ethyl acetate = 95: 1) as effluent. ^{1}H-NMR spectra were recorded in $CDCl_3$ (or CD_3OD) with TMS as an internal standard at ambient temperature on a Bruker Avance 300 operating at 300 MHz.

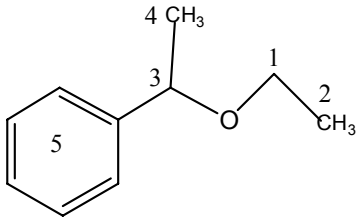
1-Methoxyethylbenzene



^{1}H-NMR δ: 7.2 (m, 5H, C_6H_5), 4.3 (q, 1H, C2-H), 3.2 (s, 3H, C1-H), 1.5 (d, 3H, C3-H)

MS (80 eV): m/z (%) = 136 (3) (M^+), 121 (100), 105 (29), 77 (20), 51(10), 91(10)

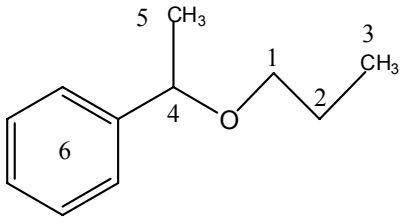
1-Ethoxyethylbenzene



^{1}H-NMR δ: 7.3 (m, 5H, C_6H_5), 4.2−4.4 (q, 1H, C3-H), 3.1−3.3 (q, 2H, C1-H), 1.5 (d, 3H, C4-H), 1.1 (t, 3H, C2-H)

MS (80 eV): m/z (%) = 150 (2) (M^+), 135 (100), 105 (100), 77 (55), 79(47), 43(29)

1-Propoxyethylbenzene

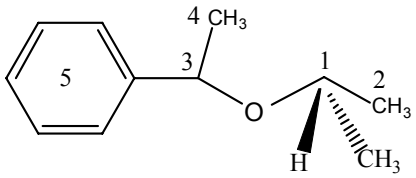


^{1}H-NMR δ: 7.3 (m, 5H, C_6H_5), 4.2−4.4(q, 1H, C4-H), 3.1−3.3 (t, 2H, C1-H), 1.5 (d, 3H,

C5-H), 1.2−1.3 (m, 2H, C2-H), 0.8 (t, 3H, C3-H)

MS (80 eV): m/z (%) = 164 (0.5) (M^+), 107 (100), 105 (88), 149 (73), 79(38), 43(29)

1-(2-Methyl-ethoxyethyl)-benzene

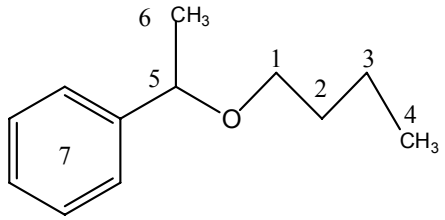


(Contain diastereomeric pairs)

^{1}H-NMR δ: 7.2 (m, 5H, C_6H_5), 4.3−4.4(q, 1H, C3-H), 3.2−3.3 (q, 1H, C1-H), 1.5 (d, 3H, C4-H), 1.2 (d, 3H, C2-H)

MS (80 eV): m/z (%) = 164 (0.3) (M^+), 107 (100), 105 (92), 149 (44), 79(38), 77(30)

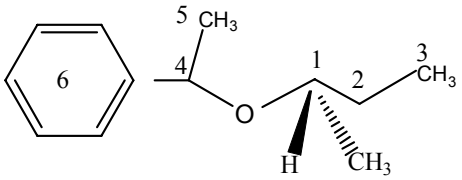
1-Butoxyethylbenzene



^{1}H-NMR δ: 7.3 (m, 5H, C_6H_5), 4.3−4.4 (q, 1H, C5-H), 3.2−3.5 (t, 2H, C1-H), 1.5 (d, 3H, C6-H), 1.2 (m, 2H, CH_2 (2-3)), 0.8 (t, 3H, C4-H)

MS (80 eV): m/z (%) = 178 (Tr) (M^+), 107 (100), 105 (88), 163 (74), 79 (28), 77 (21)

1-(2-Methyl-propoxyethyl)-benzene

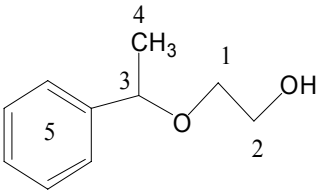


(Contain diastereomeric pairs)

^{1}H-NMR δ: 7.3 (m, 5H, C_6H_5), 4.3−4.4 (q, 1H, C4-H), 3.0 (m, 1H, C1-H), 1.5 (d, 3H, C5-H), 1.2 (d, 3H, C1-CH_3), 1.3−1.4 (q, 2H, C2-H), 0.8 (t, 3H, C3-H)

MS (80 eV): m/z (%) = 178 (Tr) (M^+), 105 (100), 107 (36), 163 (23), 106 (16), 79(13)

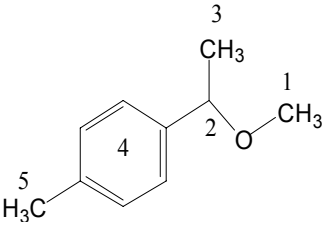
2-(1-Phenylethoxy)-ethanol



^{1}H-NMR δ: 7.2 (m, 5H, C_6H_5), 4.3−4.4 (q, 1H, C3-H), 3.4−3.5 (t, 2H, C1-H), 3.2 (s, 1H, C2-OH), 3.7 (t, 2H, C2-H), 1.5 (d, 3H, C4-H)

MS (80 eV): m/z (%) = 166 (13) (M^+), 105 (100), 151 (41), 79 (25), 77 (23), 121 (21)

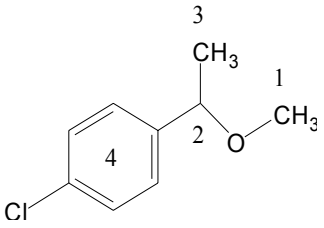
4-Methyl-1-methoxyelthylbenzene



^{1}H-NMR δ: 7.1 (m, 5H, C_6H_5), 4.3 (q, 1H, C2-H), 3.2 (s, 3H, C1-H), 1.5 (d, 3H, C3-H), 2.4 (s, 3H, C5-H)

MS (80 eV): m/z (%) = 150 (8) (M^+), 135 (100), 91 (60), 119 (41), 136 (15), 117 (13)

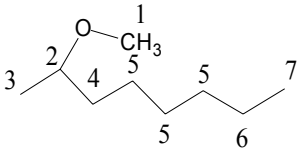
4-Chloro-1-methoxyelthylbenzene



^{1}H-NMR δ: 7.1−7.2 (m, 5H, C_6H_5), 4.3 (q, 1H, C2-H), 3.2 (s, 3H, C1-H), 1.5 (d, 3H, C3-H)

MS (80 eV): m/z (%) = 170 (5) (M^+), 155 (100), 157 (33), 139 (26), 91 (25), 103 (24)

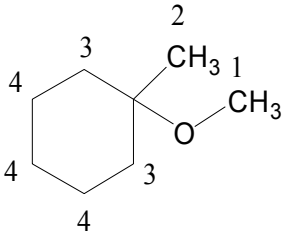
2-Methoxyoctane



^{1}H-NMR δ: 3.2 (s, 3H, C1-H), 3.0 (m, 1H, C2-H), 1.4 (q, 2H, C4-H),
1.29 (m, 2H, C5-H), 1.33 (m, 2H, C6-H), 1.2 (d, 3H, C3-H), 1.0 (t, 3H, C7-H)

MS (80 eV): m/z (%) = 144 (Tr) (M^+), 59 (100), 55 (23), 60 (8), 58 (8), 112 (1)

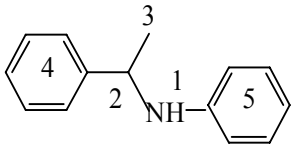
1-Methyl-1-methoxycyclohexane



^{1}H-NMR δ: 3.1 (s, 3H, C1-H), 1.5−1.6 (t, 2H, C3-H), 1.2−1.4 (t, 2H, C4-H), 1.1 (s, 3H, C1-H),

MS (80 eV): m/z (%) = 128 (48) (M^+), 85 (100), 72 (92), 55 (88), 113 (66), 81 (39)

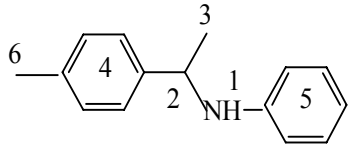
Phenyl-(1-phenyl-ethyl)-amine



^{1}H-NMR δ: 4.0 (d, 1H, CN-H), 4.1 (q, 1H, C2-H), 1.5 (d, 3H, C3-H), 7.1−7.3 (m, 5H, 4-C_6H_5), 6.4−7.1 (m, 5H, 5-C_6H_5)

MS (80 eV): m/z (%) = 197 (75) (M^+), 182 (100), 105 (84), 93 (52), 77 (34)

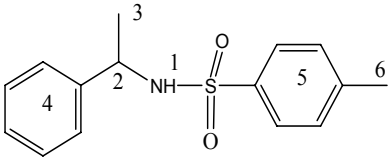
Phenyl-(1-*p*-tolyl-ethyl)-amine



^{1}H-NMR δ: 4.0 (d, 1H, CN-H), 4.1 (q, 1H, C2-H), 1.5 (d, 3H, C3-H), 7.1 (m, 4H, 4-C_6H_5), 6.4−7.0 (m, 5H, 5-C_6H_5), 2.4 (s, 3H, C6-H)

MS (80 eV): m/z (%) = 211 (Tr) (M^+), 91 (100), 196 (79), 105 (17)

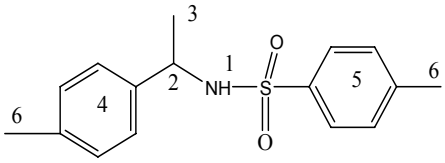
4-Methyl-*N*-(1-phenyl-ethyl)-benzenesulfonamide



^{1}H-NMR δ: 2.0 (d, 1H, CN-H), 4.1 (q, 1H, C2-H), 1.4 (d, 3H, C3-H),
7.1 (m, 5H, 4-C_6H_5), 7.3−7.8 (m, 4H, 5-C_6H_5), 2.4 (s, 3H, C6-H)

MS (80 eV): m/z (%) = 275 (Tr) (M^+), 91 (100), 260 (85), 155 (69), 120 (66)

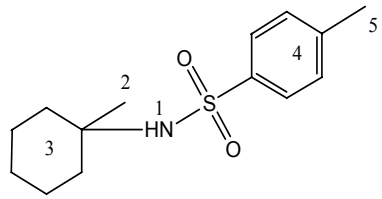
4-Methyl-*N*-(1-*p*-tolyl- ethyl)-benzenesulfonamide



^{1}H-NMR δ: 2.0 (d, 1H, CN-H), 4.1 (q, 1H, C2-H), 1.4 (d, 3H, C3-H),
7.0 (m, 4H, 4-C_6H_5), 7.3−7.8 (m, 4H, 5-C_6H_5), 2.4 (s, 3H, C6-H)

MS (80 eV): m/z (%) = 289 (Tr) (M^+), 274 (100), 134 (99), 91 (94), 155 (50).

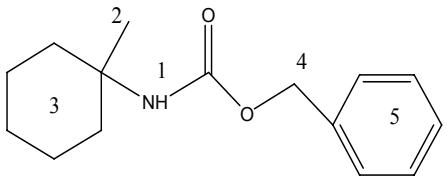
4-Methyl-*N*-(1-methyl-cyclohexyl)-benzenesulfonamide



^{1}H-NMR δ: 2.0 (s, 1H, CN-H), 1.2 (s, 3H, C2-H),
1.4−1.6 (m, 10H, C3-H), 7.3−7.8 (m, 4H, 4-C_6H_5), 2.4 (s, 3H, C5-H).

MS (80 eV): m/z (%) = 267 (28) (M^+), 224 (100), 91 (94), 155 (78), 112 (34).

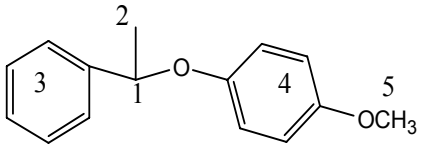
(1-Methyl-cyclohexyl)-carbamic acid benzyl ester



^{1}H-NMR δ: 8.1 (s, 1H, CN-H), 1.4 (s, 3H, C2-H), 1.4−1.6 (m, 10H, C3-H), 5.3 (s, 2H, C4-H), 7.3 (m, 5H, 5-C_6H_5).

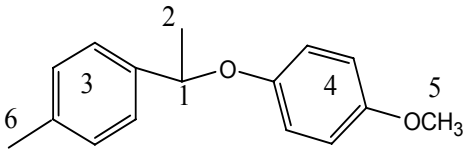
MS (80 eV): m/z (%) = 247 (3) (M^+), 91 (100), 156 (15), 160 (15), 108 (12).

1-Methoxy-4-(1-phenyl-ethoxy)-benzene



^{1}H-NMR δ: 5.2 (q, 1H, C1-H), 1.7 (d, 3H, C2-H), 7.3 (m, 5H, 3-C_6H_5) 6.7 (m, 4H, 4-C_6H_4), 3.7 (s, 3H, C5-H).

MS (80 eV): m/z (%) = 228 (100) (M^+), 213 (83), 150 (56), 198 (27), 135 (24).



^{1}H-NMR δ: 5.2 (q, 1H, C1-H), 1.7 (d, 3H, C2-H), 7.1 (m, 4H, 3-C_6H_5) 6.7 (m, 4H, 4-C_6H_4), 3.7 (s, 3H, C5-H), 2.4 (s, 3H, C6-H).

MS (80 eV): m/z (%) = 242 (100) (M^+), 150 (81), 227 (74), 135 (20), 212 (15).