Inorganic Chemistry
including bioinorganic chemistry
Inorg. Chem., 1998, 37(5), 1091-1098, DOI:10.1021/ic971115f

Synthesis of α-halo amide derivatives. *N-tert*-butyl-2-chloroacetamide.[1] The following procedure for the preparation of *N-tert*-butyl-2-chloroacetamide is typical for the class, with the only variation for the different examples being the choice of amine and acid halide precursors used in the acylation reaction. To a stirred solution of *tert*-butylamine (1.44 mL, 1.37 mmol), 20% sodium hydroxide solution (3.4 g), and methylene chloride (5 mL) at 0 °C was added chloroacetylchloride (1.19 mL, 1.42 mmol mmol) dropwise over 20 minutes. Following completion of the addition, the temperature of the solution was allowed to warm to room temperature. The aqueous layer was then separated and washed with CH_2Cl_2 (2 x 50 mL). The combined CH_2Cl_2 fractions were washed with 1M HCl (20 mL), saturated sodium bicarbonate solution (20 mL), and water (20 mL). The organic layer was then dried (Na_2SO_4), filtered, and the solvent was removed under vacuum to yield the pure product as a white solid. All of the derivatives described below were isolated as white solids with the exception of *N*-methyl-*N-tert*-butyl-2-chloroacetamide which is a colorless oil. Yield: 60%. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 6.36 (br, 1H), 3.92 (s, 2H), 1.36 (s, 9H); $^{13}C\{^1H\}$ NMR ($CDCl_3$, 75 MHz): δ 164.9, 51.8, 42.9, 28.5; FTIR (KBr, cm^{-1}): 3300 (N-H), 1675 (C=O); GC/MS t_R 5.71 min; m/z (relative intensity) 149 (5, M^+), 58 (100); Melting point: 82-83 °C.

***N*-methyl-*N-tert*-butyl-2-chloroacetamide.**[2] Yield: 73%. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 4.05 (s, 2H), 2.95 (s, 3H), 1.41 (s, 9H); $^{13}C\{^1H\}$ NMR ($CDCl_3$, 75 MHz): δ 166.8, 57.5, 44.5, 32.4, 27.9; FTIR (neat, cm^{-1}): 1659 (C=O); GC/MS t_R 7.26 min; m/z (relative intensity) 164 (5, M^+), 72 (100).

***N-tert*-butyl-2-bromopropionamide.**[3] Yield: 73%. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 6.17 (br, 1H), 4.29 (quartet, J = 6.9 Hz, 1H), 1.82 (d, J = 6.9 Hz, 3H), 1.34 (s, 9H); $^{13}C\{^1H\}$ NMR ($CDCl_3$, 75 MHz): δ 168.4, 51.7, 46.0, 28.4, 23.1; FTIR (KBr, cm^{-1}): 3300 (N-H), 1655 (C=O); GC/MS t_R 6.60 min; m/z (relative intensity) 207/209 (10, M^+), 58 (100); Melting Point: 120-123 °C.

***N*-methyl-*N-tert*-butyl-2-bromopropionamide**. Yield: 74%.^{1}H NMR ($CDCl_3$, 300 MHz): δ 4.54 (quartet, J = 6.6 Hz, 1H), 2.98 (s, 3H), 1.79 (d, J = 6.6 Hz, 3H), 1.55 (s, 3H),

1.42 (s, 9H); $^{13}C\{^{1}H\}$ NMR ($CDCl_3$, 75 MHz): δ 169.4, 57.5, 42.0, 32.3, 27.9, 22.1; FTIR (KBr, cm^{-1}): 1645 (C=O); GC/MS t_R 7.97 min; m/z (relative intensity) 221/223 (10, M^+), 72 (100). Melting point: 46-48 °C.

1. (a) Speziale, A. J.; Hamm, P. C. *J. Am. Chem. Soc.* **1955**, *78*, 2556-2559. (b) Hayon, E.; Ibata, T.; Lichtin, N. N.; Simic, M. *J. Am. Chem. Soc.* **1971**, *93*, 5388-5390. (c) Nyquist, R. A.*Spectrochim. Acta* **1963**, *19*, 509-519. (d) Lacey, R. N. *J. Chem. Soc.* **1960**, 1633-1639. (e) Lowe, J. A.; Hageman, D. L.; Drozda, S. E.; McLean, S.; Bryce, D. K.; Crawford, R. T.; Zorn, S..; Morrone, J. Bordner, J. *J. Med. Chem.* **1994**, *37*, 3789-3811.

2. Lowe, J. A.; Hageman, D. L.; Drozda, S. E.; McLean, S.; Bryce, D. K.; Crawford, R. T.; Zorn, S..; Morrone, J. Bordner, J.*J. Med. Chem.* **1994**, *37*, 3789-3811.

3. Safir, S. R.; Dalalian, H.; Fanshawe, W.; Cyr, K.; Lopresti, R.; Williams, R.; Upham, S.; Goldman, L.; Kushner, S. *J. Am. Chem. Soc.* **1955**, *77*, 4840-4841.

Table S1. ^{1}H NMR or EPR Data for Amide-Appended Ligands and Copper Complexes

Entry	Complex	^{1}H NMR[a,b](ppm) or EPR[c]
1	L^{HAmH}	7.95 (br, 1H), 3.08 (s, 2H), 2.84 (heptet, J = 6.6 Hz, 2H), 2.60-2.75 (m, 12H), 1.35 (s, 9H), 0.95 (d, J = 6.6 Hz, 12H)
2	L^{HAmMe}	3.28 (s, 2H), 3.00 (s, 3H), 2.80-2.90 (m, 6H), 2.60-2.70 (m, 4H), 2.53 (m, 4H), 1.39 (s, 9H), 0.94 (d, J = 6.6 Hz, 12H)
3	L^{MeAmH}	8.20 (br, 1H) 3.11 (quartet, J = 7.2 Hz, 1H), 2.40-2.86 (m, 14H), 1.34 (s, 9H), 1.20 (d, J = 7.2 Hz, 3H), 0.99 (d, J = 6.6 Hz, 6H), 0.93 (d, J = 6.6 Hz, 6H)
4	L^{MeAmMe}	3.51 (quartet, J = 7.2 Hz, 1H), 3.11 (s, 3H), 2.79 (m, 4H), 2.50-2.65 (m, 10H), 1.39 (s, 9H), 1.09 (d, J = 7.2 Hz, 3H), 0.92 (d, J = 6.6 Hz, 12H)
5	L^{Piv}	6.10 (br, 1H), 3.20 (s, 2H), 2.82 (heptet, J = 6.6 Hz, 2H), 2.54-2.76 (m, 14H), 1.19 (s, 9H), 0.95 (d, J = 6.6 Hz, 12H)
6	$[L^{HAmH}Cu(CH_3CN)]ClO_4$	6.30 (br, 1H), 3.39 (s, 2H), 3.06 (heptet, J = 6.6 Hz, 2H), 2.70-3.00 (m, 8H), 2.45-2.60 (m, 4H), 1.31 (d, J = 6.6 Hz, 6H), 1.20 (d, J = 6.6 Hz, 6H)
7	$[L^{HAmMe}Cu(CH_3CN)]ClO_4$	3.72 (s, 2H), 2.40-3.30 (m, 17H), 1.38 (s, 9H), 1.21 (m, 12H)
8	$[L^{MeAmH}Cu(CH_3CN)]SbF_6$	6.30 (br, 1H), 3.53-3.62 (m, 1H), 3.31 (quartet, J = 6.9 Hz, 1H), 3.05 (heptet, J = 6.6 Hz, 2H), 2.44-2.89 (m, 13H), 1.42 (d, J = 6.9 Hz, 3H), 1.30 (s, 9H), 1.23 (d, J = 6.6 Hz, 6H), 1.18 (d, J = 6.6 Hz, 6H)
9	$[L^{MeAmMe}Cu(CH_3CN)]SbF_6$	3.95 (quartet, J = 6.6 Hz, 1H), 3.62 (m, 1H), 3.07 (heptet, J = 6.6 Hz, 2H), 2.90 (s, 3H), 2.46-2.89 (m, 11H), 1.44 (d, J = 6.6 Hz, 3H), 1.39 (s, 9H), 1.15-1.26 (m, 12H)
10	$[L^{Piv}Cu(CH_3CN)]O_3SCF_3$	6.80 (br, 1H), 3.55 (m, 2H), 3.10 (heptet, J = 6.6 Hz, 2H), 2.43-2.96 (m, 16H), 2.23 (3H), 1.24 (d, J = 6.6 Hz, 6H), 1.22 (d, J = 6.6 Hz, 6H)
11	$[L^{MeAmH}Cu(CO)]SbF_6$	7.23 (br, 1H), 3.58 (quartet, J = 6.6 Hz, 1H), 3.00-3.46 (m, 8H), 2.74-2.98 (m, 6H), 1.53 (d, J = 6.6 Hz, 3H), 1.36 (s, 9H), 1.30-1.38 (m, 12H)
12	$[L^{MeAmMe}Cu(CO)]SbF_6$	4.25 (quartet, J = 6.6 Hz, 1H), 3.39 (heptet, J = 6.6 Hz, 2H), 2.80-3.30 (m, 15H), 1.53 (d, J = 6.6 Hz, 3H), 1.44 (s, 9H), 1.30-1.40 (m, 12H)

13	$[L^{HAmMe}CuCl]ClO_4 \cdot H_2O$	$g_{//} \approx 2.26$, $g_{\perp} \approx 2.06$, $A_{//} \approx 149$ G
14	$[L^{MeAmH}CuCl]PF_6 \cdot MeOH$	$g_{//} \approx 2.26$, $g_{\perp} \approx 2.06$, $A_{//} \approx 136$ G
15	$[L^{Piv}Cu(O_3SCF_3)](O_3SCF_3)$	$g_{//} \approx 2.28$, $g_{\perp} \approx 2.07$, $A_{//} \approx 155$ G

[a] ^1H NMR spectra of ligands obtained in $CDCl_3$; spectra of Cu(I) complexes obtained in CD_3CN ($[L^{RAmR'}Cu(CH_3CN)]X$), d_6-acetone ($[L^{MeAmR'}Cu(CO)]SbF_6$), or CD_2Cl_2 ($[L^{Piv}Cu(CH_3CN)]OTf$). [b] Spectra obtained at 300 MHz using a Varian VXR300 or VarianVI300 spectrometer. [c] EPR spectra obtained on 1:1 CH_2Cl_2:toluene soutions (~2 mM) using a Bruker ESP300 spectrometer fitted with a liquid nitrogen finger dewar (77K, ~9.4 GHz).

Table S2. $^{13}C\{^{1}H\}$ NMR Data for Amide-Appended Ligands and Copper Complexes

Entry	Complex	$^{13}C\{^{1}H\}$ NMR (ppm)[a,b]
1	L^{HAmH}	171.80, 63.41, 58.69, 54.98, 54.75, 50.57, 50.40, 28.83, 18.19
2	L^{HAmMe}	172.04, 63.94, 56.02, 54.58, 52.79, 52.26, 31.82, 28.10, 18.40
3	L^{MeAmH}	174.34, 64.17, 55.31, 55.08, 54.66, 50.28, 50.14, 28.77, 20.28, 16.04, 9.46
4	L^{MeAmMe}	173.84, 62.26, 56.60, 54.16, 53.65, 52.84, 52.65, 31.53, 28.20, 18.54, 18.28, 10.20
6	L^{Piv}	178.5, 56.7, 56.6, 54.7, 53.6, 51.9, 38.6, 37.3, 27.7, 18.3
7	$[L^{HAmH}Cu(CH_3CN)]ClO_4$	168.34, 60.46, 57.68, 53.12, 50.86, 50.29, 49.57, 29.87, 19.34, 18.94
8	$[L^{HAmMe}Cu(CH_3CN)]ClO_4$	169.45, 59.41, 57.66, 56.77, 52.75, 50.14, 49.84, 30.23, 27.41, 19.52, 18.80
9	$[L^{MeAmH}Cu(CH_3CN)]SbF_6$	171.7, 64.4, 57.8, 57.7, 55.0, 53.4, 52.7, 50.9, 48.4, 47.7, 46.6, 27.8, 19.9, 19.8, 18.3, 18.1, 17.2
10	$[L^{MeAmMe}Cu(CH_3CN)]SbF_6$	173.50, 61.37, 57.84, 57.48, 56.99, 54.96, 53.77, 52.28, 48.23, 47.93, 46.87, 31.33, 27.29, 20.32, 19.37, 18.39, 18.14, 16.50
11	$[L^{Piv}Cu(CH_3CN)]O_3SCF_3$	178.7, 116.9, 59.5, 57.9, 54.4, 50.4, 50.3, 38.4, 37.5, 27.3, 19.8, 19.2, 3.0

[a]Spectra of ligands obtained in $CDCl_3$; spectra of Cu(I) complexes obtained in CD_3CN ($[L^{RAmR'}Cu(CH_3CN)]X$) or CD_2Cl_2 ($[L^{Piv}Cu(CH_3CN)]OTf$). [b]Spectra obtained at 75 MHz using a Varian VXR300 or VarianVI300 spectrometer.