

Synthesis of 5-alkyl-2-amino-1,3,4-thiadiazoles and α,ω -bis(2-amino-1,3,4-thiadiazol-5-yl)alkanes in ionic liquids

Margarita A. Epishina, Alexander S. Kulikov, Nikolai V. Ignat'ev, Michael Schulte and Nina N. Makhova*

5-Propyl-1,3,4-thiadiazol-2-amine 1b: yield 73% (procedure 1), 68% (procedure 2), mp 203–205 °C (lit.,¹³ 203–206 °C). ¹H NMR ([²H₆]DMSO) δ : 0.85 (t, 3H, Me, ³J 7.2 Hz), 1.75 (q, 2H, CH₂Me, ³J 9.8 Hz), 2.55 (t, 2H, CH₂C_{ring}, ³J 7.0 Hz), 7.05 (br. s. 2H, NH₂). ¹³C NMR ([²H₆]DMSO) δ : 13.26 (CH₃), 22.40 (CH₃CH₂), 31.24 (CH₃CH₂CH₂), 158.19 (C_{ring}CH₂), 168.10 (C-NH₂). IR (ν /cm⁻¹): 3290, 3106, 2928, 2872, 1636, 1568, 1520, 1496, 1456, 1404, 1376, 1332, 1240, 1188, 1144, 1100, 1044, 904, 868, 812.

5-Isopropyl-1,3,4-thiadiazol-2-amine 1c: yield 76% (procedure 1), 76% (procedure 2), mp 181–183 °C (lit.,¹³ 182–185 °C). ¹H NMR ([²H₆]DMSO) δ : 1.27 (d, 6H, 2Me, ³J 7.0), 3.30 (t, 1H, CH, ³J 7.0), 6.85 (br. s, 2H, NH₂). ¹³C NMR ([²H₆]DMSO) δ : 22.61 (CH₃), 29.98 (CH), 164.60 (C_{ring}CH), 167.84 (C-NH₂). IR (ν /cm⁻¹): 3276, 3105, 2964, 2868, 1624, 1568, 1520, 1488, 1456, 1436, 1384, 1364, 1336, 1304, 1212, 1140, 1048, 1024, 884, 784.

5-(1-Benzoylaminoethyl)-1,3,4-thiadiazol-2-amine 1f: yield 96% (procedure 1), 90% (procedure 2), mp 220 °C. ¹H NMR ([²H₆]DMSO) δ : 1.57 (d, 3H, Me, ³J 7.8 Hz), 5.33 (q, 1H, CH, ³J 7.8 Hz), 7.05 (br. s, 2H, NH₂), 7.55 (m, 3H, Ph, ³J 7.6 Hz), 7.92 (d, 2H, Ph, ³J 7.6 Hz), 9.02 (d, 1H, NH, ³J 8.6 Hz). ¹³C NMR ([²H₆]DMSO) δ : 20.00 (Me), 45.62 (CH), 127.97, 128.86, 132.02, 134.53 (Ph), 162.02 (C_{ring}CH), 166.40, 169.44 (C-NH₂, C=O). IR (ν /cm⁻¹): 3260, 3168, 1640, 1580, 1512, 1492, 1456, 1436, 1316, 1264, 1216, 1144, 1076, 1060, 968, 936, 870, 836, 820, 804, 784. MS, m/z (I %): 248 (M⁺, 2), 247 (M⁺-1, 6), 143 (M⁺- PhCO, 92), 105 (PhCO, 72), 77 (NH₂CSNH₂ + 1, 100).

Bis(5-amino-1,3,4-thiadiazol-2-yl)methane 2a: yield 41% (procedure 1), 38% (procedure 2), mp 272–273 °C (lit.,¹⁸ 270 °C). ¹H NMR ([²H₆]DMSO) δ : 4.44 (s, 2H, CH₂), 7.15 (s, 4H, 2NH₂). ¹³C NMR ([²H₆]DMSO) δ : 30.48 (CH₂), 153.86 (C_{ring}CH₂), 169.31 (C-NH₂). IR (ν /cm⁻¹): 3368, 3264, 3095, 1636, 1612, 1516, 1480, 1416, 1376, 1324, 1168, 1132, 1060, 904, 716. MS, m/z (I %): 214 (M⁺, 100), 172 (M⁺ - NCNH₂, 95), 141 (ring-CH₂CN + 1, 67) 127 (ring-CH₂CH, 33), 114 (ring-CH₂, 93).

1,3-Bis(5-amino-1,3,4-thiadiazol-2-yl)propane 2c: yield 98% (procedure 1), 95% (procedure 2), mp 288–290 °C. ¹H NMR ([²H₆]DMSO) δ: 1.98 (t, 2H, CH₂CH₂CH₂ ³J 6.5 Hz), 2.76 (t, 4H, CH₂CH₂CH₂ ³J 6.5 Hz), 7.08 (s, 4H, 2NH₂). ¹³C NMR ([²H₆]DMSO) δ: 28.58 (CH₂CH₂CH₂), 32.61 (CH₂CH₂CH₂), 157.53 (C_{ring}CH₂), 168.30 (C-NH₂). IR (ν/cm⁻¹): 3280, 3088, 1620, 1528, 1516, 1448, 1428, 1340, 1240, 1204, 1056, 1024, 800, 692. MS, *m/z* (I %): 128 (ring-CH₂CH₂, 100), 115 (ring-CH₃, 85), 74 (34).