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Electronic Supplementary Information

General Synthetic Methods. Solvents were distilled prior to use. DABCO-based bromides were synthesized by Menschutkin reaction of 1,4-diazabicyclo[2.2.2]octane with the appropriate alkyl bromides. A typical procedure is reported below:

To a colorless solution of DABCO (1,4-diazabicyclo[2.2.2]octane, Aldrich 98%, 10.0 g, 86 mmol) in anhydrous ethyl acetate (50 ml) a solution of bromoethane (Aldrich 98%, 6.45 ml, 85 mmol) in the same solvent (50 ml) was slowly added (dropping for 1 h at r.t. under air), then the reaction mixture was stirred for 2 h at r.t. The formed solid was separated by filtration, initially washed by anhydrous AcOEt (2x10 ml), dried in vacuum ($2x10^{-3}$ mmHg, 60°C, 1h) and then rewashed by anhydrous THF (2x20 ml) and dried in vacuum to give pure $[C_2DABCO]Br$ (**1a)**, 18.58 g, 99 % yield. T*m* 73.25 °C: ^1H NMR (250 MHz, D_2O): δ (ppm) =1.31 (tt, J=7.23, 2.0 Hz, 3H, $CH_3CH_2N^+(CH_2CH_2)_3N$), 3.17 (t, J=6.8 Hz, 6H, $CH_3CH_2N^+(CH_2CH_2)_3N$), 3.34 (m, 2H, $CH_3CH_2N^+(CH_2CH_2)_3N$), 3.37 (t, J=7.3 Hz, 6H, $CH_3CH_2N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 6.78 ($CH_3CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3CH_2N^+(CH_2CH_2)_3N$), 51.5 ($CH_3CH_2N^+(CH_2CH_2)_3N$), 59.9 ($CH_3CH_2N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 141, $[C_2DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-Propyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_3DABCO]Br$**, 1b:**

T*m* 103 °C. ^1H NMR (250 MHz, $CDCl_3$): δ (ppm) = 0.94 (t, J=7.3 Hz, 3H, $CH_3(CH_2)_2N^+(CH_2CH_2)_3N$), 1.76 (m, 2H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 3.16 (t, J=7.6 Hz, 6H, $CH_3(CH_2)_2N^+(CH_2CH_2)_3N$), 3.23 (m, 2H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 3.83 (t, J=7.4 Hz, 6H, $CH_3(CH_2)_2N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 9.8 ($CH_3(CH_2)_2N^+(CH_2CH_2)_3N$), 14.9 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_2N^+(CH_2CH_2)_3N$), 65.9 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_2N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 155, $[C_3DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-butyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, [C_4DABCO]Br**, 1c:**

T*m* 133 °C. ^{1}H NMR (250 MHz, $CDCl_3$): δ (ppm) = 0.93 (t, J=7.3 Hz, 3H, $CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 1.36 (m, 2H, $CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.73 (m, 2H, $CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.17 (m, 2H, $CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.26 (t, J=7.4 Hz, 6 H, $CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 3.40 (t, J=7.4 Hz, 6 H, $CH_3(CH_2)_3N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 12.7 ($CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 19.1 ($CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 23.0 ($CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 64.4 ($CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 51.9 ($CH_3(CH_2)_3N^+(CH_2CH_2)_3N$). m/z ESI-MS (+): 169, [C_4DABCO]$^+$. m/z ESI- MS (-): 81, [Br]$^-$, 98 %; 79, [Br]$^-$, 100 %.

1-pentyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, [C_5DABCO]Br, **1d:**

T*m* 104 °C. ^{1}HNMR (250 MHz, $CDCl_3$): δ (ppm) = 0.85 (t, J=7.0 Hz, 3H, $CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 1.31 (m, 4 H, $CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.73 (m, 2 H, $CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.15 (t, J=7.1 Hz, 6 H, $CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 3.21 (m, 2 H, $CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.37 (t, J=7.3 Hz, 6 H, $CH_3(CH_2)_4N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 12.9 ($CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 21.4, 27.6 ($CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 20.7 ($CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_3CH_2N^+(CH_2CH_2)_3N$), 51.9 ($CH_3(CH_2)_4N^+(CH_2CH_2)_3N$). *m*/*z* ESI-MS (+): 183, [C_5DABCO]$^+$. *m*/*z* ESI- MS (-): 81, [Br]$^-$, 100 %; 79, [Br]$^-$, 98 %.

1-hexyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, [C_6DABCO]Br, **1e:**

T*m* 112 °C. ^{1}H NMR (250 MHz D_2O): δ (ppm) = 0.84 (t, J=6.9 Hz, 3H, $CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 1.30 (m, 6 H, $CH_3CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.73 (m, 2 H, $CH_3CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.16 (t, J=7.6 Hz, 6 H, $CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 3.24 (m, 2 H, $CH_3(CH2)_4CH_2N^+(CH_2CH_2)_3N$), 3.38 (t, J=7.4 Hz, 6 H, $CH_3(CH_2)_5N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.1 ($CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 21.6, 25.1, 30.3 ($CH_3CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 21.0 ($CH_3(CH_2)_3CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_4CH_2N^+(CH_2CH_2)_3N$), 51.9 ($CH_3(CH_2)_5N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 197, $[C_6DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-heptyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_7dabco]Br$, **1f:**

T*m* 58 °C. ^{1}H NMR (250 MHz, D_2O): δ (ppm) = 0.85 (t, J=6.1 Hz, 3H, $CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 1.28 (m, 8H, $CH_3CH_2CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.74 (m, 2H, $CH_3(CH_2)_4CH_2CH_2N^+(CH_2CH_2)_3N$), 3.17 (t, J = 7.1 Hz, 6 H, $CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 3.23 (m, 2 H, $CH_3(CH_2)_5CH_2N^+(CH_2CH_2)_3N$), 3.38 (t, J = 7.3 Hz, 6 H, $CH_3(CH_2)_6N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.3 ($CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 21.8, 25.5, 27.8, 30.7 ($CH_3CH_2CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 21.1 ($CH_3(CH_2)_4CH_2CH_2N^+(CH_2CH_2)_3N$), 44.2 ($CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 64.7 ($CH_3(CH_2)_5CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_6N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 211, $[C_7DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-octyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_8DABCO]Br$, **1g**:

T*m* 74.4 °C. ^{1}H NMR (250 MHz D_2O): δ (ppm) = 0.82 (t, J=6.2 Hz, 3H, $CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 1.28 (m, 10 H, $CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.74 (m, 2H, $CH_3(CH_2)_5CH_2CH_2N^+(CH_2CH_2)_3N$), 3.17 (t, J=7.5 Hz, 6H, $CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 3.23 (m, 2 H, $CH_3(CH_2)_6CH_2N^+(CH_2CH_2)_3N$), 3.38 (t, *J=7.3 Hz*, 6 H,

$CH_3(CH_2)_7N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.4 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 22.0, 25.5, 28.1, 28.2, 31.0 ($CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 21.1 ($CH_3(CH_2)_5CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_6CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 225, $[C_8DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-nonyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_9DABCO]Br$, **1h:**

T*m* 41 °C. ^1H NMR (250 MHz, D_2O): δ (ppm) = 0.84 (t, J=6.8 Hz, 3H, $CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 1.29 (m, 12H, $CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 1.74 (m, 2H, $CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 3.18 (t, J=7.5 Hz, 6 H, $CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 3.24 (m, 2 H, $CH_3(CH_2)_7CH_2N^+(CH_2CH_2)_3N$), 3.40 (t, J=7.4 Hz, 6 H, $CH_3(CH_2)_8N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm), 13.4 ($CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 22.0, 25.6, 28.2, 28.3, 28.5, 31.1 ($CH_3(CH_2)_6(CH_2)_2N^+(CH_2CH_2)_3N$), 21.1 ($CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_7CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_8N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 239, $[C_9DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-decyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_{10}DABCO]Br$, **1i:**

T*m* 44 °C. ^1H NMR (250 MHz D_2O): δ (ppm) = 0.82 (t, J=6.3 Hz, 3 H, $CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 1.28 (m, 14H, $CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 1.72 (m, 2H, $CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 3.16 (t, J=7.3Hz, 6 H, $CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 3.22 (m, 2 H, $CH_3(CH_2)_8CH_2N^+(CH_2CH_2)_3N$), 3.37 (t, J=7.3 Hz, 6 H, $CH_3(CH_2)_9N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.4 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 22.0, 25.5, 28.1, 28.4, 28.6, 31.1 ($CH_3(CH_2)_7(CH_2)_2N^+(CH_2CH_2)_3N$), 21.1 ($CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_8CH_2N^+(CH_2CH_2)_3N$), 52.0

($CH_3(CH_2)_9N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 253, $[C_7DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-undecyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_{11}dabco]Br$, **1l:**

T*m* 47 °C. ^1H NMR (250 MHz D_2O): δ (ppm) = 0.84 (t, J=6.0 Hz, 3H, $CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 1.29 (m, 16H, $CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 1.76 (m, 2H, $CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 3.19 (t, J=6.3 Hz, 6 H, $CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 3.30 (m, 2H, $CH_3(CH_2)_9CH_2N^+(CH_2CH_2)_3N$), 3.42 (t, J=6.3 Hz, 6 H, $CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.6 ($CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 22.3, 25.8, 28.5, 28.9, 29.0, 31.5 ($CH_3(CH_2)_8(CH_2)_2N^+(CH_2CH_2)_3N$), 21.3 ($CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 64.5 ($CH_3(CH_2)_9CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 267, $[C_{11}DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-dodecyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_{12}DABCO]Br$, **1m:**

T*m* 61 °C. ^1H NMR (250 MHz, D_2O): δ (ppm) = 0.83 (t, J=6.3 Hz, 3H, $CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 1.29 (m, 18H, $CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 1.73 (m, 2H, $CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 3.17 (t, J=8.3 Hz, 6 H, $CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 3.24 (m, 2 H, $CH_3(CH_2)_{10}CH_2N^+(CH_2CH_2)_3N$), 3.39 (t, J=6.9 Hz, 6 H, $CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.5 ($CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 22.1, 25.6, 28.3, 28.8, 28.9, 31.3 ($CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 21.2 ($CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 64.5 ($CH_3(CH_2)_{10}CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 281, $[C_7DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

1-hexadecyl-4-aza-1-azaniabicyclo[2.2.2]octane bromide, $[C_{16}DABCO]Br$, **1n:**

T*m* 74 °C. ^{1}H NMR (250 MHz D_2O): δ (ppm) = 0.86 (t, J=6.3 Hz, 3H, $CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 1.27 (m, 26 H, $CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 1.78 (m, 2 H, $CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 3.22 (t, *J=6.5 Hz,* 6 H, $CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 3.35 (m, 2 H, $CH_3(CH_2)_{14}CH_2N^+(CH_2CH_2)_3N$), 3.50 (t, *J=5.3 Hz,* 6 H, $CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.8 ($CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 22.7, 26.4, 29.3, 29.7, 29.8, 30.0, 30.2, 32.1 ($CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 21.8 ($CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 44.2 ($CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 64.3 ($CH_3(CH_2)_{14}CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$). *m/z* ESI-MS (+): 337, $[C_7DABCO]^+$. *m/z* ESI- MS (-): 81, $[Br]^-$, 98 %; 79, $[Br]^-$, 100 %.

A typical procedure for the synthesis of DABCO-based dicyanammides is reported below:

To a colourless solution of $C_2DABCOBr$ (15.00 g, 67.8 mmol) in water (100 ml) silver dicyanamide (colourless solid, freshly prepared from $AgNO_3$ and $NaN(CN)_2$) was added. The mixture was stirred for 3 h at 40°C. After cooling at r.t. the precipitate was filtered off, washed with water (2x10 ml) and the resulting colourless aqueous solution (approximately 200 ml) was heated to 70 °C under vacuum for 1 h to remove the water. The colourless liquid was dissolved in anhydrous acetone (Carlo Erba reagents, HPLC grade, 200 ml), and the solution was cooled at -20°C for 48 h. After filtration on glass septa (porosity 4) contained two different powder layers (1 cm, each): celite (lower layer) and decolorizing-carbon (upper layer), the solvent was removed under vacuum ($2x10^{-3}$ mmHg, 80°C, 6h) to give pure 1-ethyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_2DABCO][N(CN)_2]$, **3a**, yield (90 %).

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^{1}H NMR (250 MHz, D_2O): δ (ppm) = 1.32 (tt, J=7.23Hz, J=2Hz, 3H, $CH_3CH_2N^+(CH_2CH_2)_3N$), 3.17 (t, J=6.8 Hz, 6 H, $CH_3CH_2N^+(CH_2CH_2)_3N$), 3.31 (t, 2 H, $CH_3CH_2N^+(CH_2CH_2)_3N$), 3.36 (t, J=7.3 Hz, 6 H, $CH_3CH_2N^+(CH_2CH_2)_3N$). ^{13}C NMR

(63 MHz, D_2O): δ (ppm) = 6.7 ($CH_3CH_2N^+(CH_2CH_2)_3N$), 44.1($CH_3CH_2N^+(CH_2CH_2)_3N$), 51.5 ($CH_3CH_2N^+(CH_2CH_2)_3N$), 59.9 ($CH_3CH_2N^+(CH_2CH_2)_3N$),119.9 $[N(CN)_2]^-$

1-propyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_3dabco][N(CN)_2]$, **3b**:

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, $CDCl_3$): δ (ppm) = 0.97 (t, J=7.3 Hz, 3 H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 1.78 (m, 2 H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 3.18 (t, J=7.6 Hz, 6 H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$),3.24 (m, 2 H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 3.56 (t, J=7.4 Hz, 6 H, $CH_3CH_2CH_2N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 9.9 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 14.9 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 65.9 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3CH_2CH_2N^+(CH_2CH_2)_3N$).119.9 $[N(CN)_2]^-$

1-butyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_4DABCO][N(CN)_2]$, **3c**:

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, $CDCl_3$): δ (ppm) = 0.98 (t, J=7.3 Hz, 3H, $CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 1.40 (m, 2H, $CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.74 (m, 2H, $CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.21 (m, 2H, $CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.27 (t, J=7.4 Hz, 6H, $CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 3.41 (t, J=7.4 Hz, 6H, $CH_3(CH_2)_3N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 12.8 ($CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 19.1 ($CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 23.1 ($CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 64.4 ($CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_3N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$

1-pentyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_5DABCO][N(CN)_2]$, **3d**:

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, $CDCl_3$): δ (ppm) = 0.92 (t, J=7.0 Hz, 3H, $CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 1.40 (m, 4 H, $CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 1.79 (m, 2H, $CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 3.22 (t, J=7.1 Hz, 6H,

$CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 3.28 (m, 2 H, $CH_3(CH_2)_3CH_2N^+(CH_2CH_2)_3N$), 3.43 (t, J=7.3 Hz, 6H, $CH_3(CH_2)_4N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.1 ($CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 21.5, 27.7 ($CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 20.8 ($CH_3CH_2CH_2CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_4N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_3CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_4N^+(CH_2CH_2)_3N$). 119.9 $[N(CN)_2]^-$

1-hexyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_6DABCO][N(CN)_2]$, **3e:**

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (200 MHz D_2O): δ = 0.89 (t, J=6.9 Hz, 3H, $CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 1.35 (m, 6H, $CH_3(CH_2)_3CH_2CH_2N^+(CH_2CH_2)_3N$), 1.80 (m, 2H, $CH_3(CH_2)_3CH_2CH_2N^+(CH_2CH_2)_3N$), 3.19 (t, J=7.6 Hz, 6 H, $CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 3.29 (m, 2 H, $CH_3(CH_2)_4CH_2N^+(CH_2CH_2)_3N$), 3.56 (t, J=7.4 Hz, 6 H, $CH_3(CH_2)_5N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.2 ($CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 21.7, 25.2, 30.4 ($CH_3(CH_2)_3CH_2CH_2N^+(CH_2CH_2)_3N$), 21.1 ($CH_3(CH_2)_3CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 64.7 ($CH_3(CH_2)_4CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_5N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$

1-heptyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_7DABCO][N(CN)_2]$, **3f:**

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz D_2O): δ = 0.88 (t, J=6.1 Hz, 3H, $CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 1.33 (m, 8H, $CH_3(CH_2)_4CH_2CH_2N^+(CH_2CH_2)_3N$), 1.77 (m, 2H, $CH_3(CH_2)_4CH_2CH_2N^+(CH_2CH_2)_3N$), 3.19 (t, J=7.1 Hz, 6 H, $CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 3.27 (m, 2 H, $CH_3(CH_2)_5CH_2N^+(CH_2CH_2)_3N$), 3.39 (t, J=7.3 Hz, 6 H, $CH_3(CH_2)_6N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.4 ($CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 21.9, 25.6, 27.9, 30.8 ($CH_3(CH_2)_4CH_2CH_2N^+(CH_2CH_2)_3N$), 21.1 ($CH_3(CH_2)_4CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 64.7 ($CH_3(CH_2)_5CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_6N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.

1-octyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide , $[C_8DABCO][N(CN)_2]$, **3g**:

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, D_2O): δ = 0.87 (t, J=6.2 Hz, 3H, $CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 1.33 (m, 10 H, $CH_3(CH_2)_5CH_2CH_2N^+(CH_2CH_2)_3N$), 1.78 (m, 2 H, $CH_3(CH_2)_5CH_2CH_2N^+(CH_2CH_2)_3N$), 3.18 (t, J=7.5 Hz, 6 H, $CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 3.27 (m, 2 H, $CH_3(CH_2)_6CH_2N^+(CH_2CH_2)_3N$), 3.38 (t, J=7.3 Hz, 6 H, $CH_3(CH_2)_7N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.4 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 22.2, 25.7, 28.3, 28.4, 31.2 ($CH_3(CH_2)_5CH_2CH_2N^+(CH_2CH_2)_3N$), 21.2 ($CH_3(CH_2)_5CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_6CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_7N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.

1-nonyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_9DABCO][N(CN)_2]$, **3h:**

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, D_2O): δ = 0.89 (t, J=6.8 Hz, 3 H, $CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 1.34 (m, 12 H, $CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 1.78 (m, 2 H, $CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 3.23 (t, J=7.5 Hz, 6 H, $CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 3.29 (m, 2 H, $CH_3(CH_2)_7CH_2N^+(CH_2CH_2)_3N$), 3.52 (t, J=7.4 Hz, 6 H, $CH_3(CH_2)_8N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.7 ($CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 22.4, 25.9, 28.7, 28.8, 29.0, 31.5 ($CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 21.4 ($CH_3(CH_2)_6CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_7CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_8N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.

1-decyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_{10}DABCO][N(CN)_2]$, **3i**:

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz D_2O): δ = 0.88 (t, J=6.3 Hz, 3 H, $CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 1.30 (m, 14 H, $CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 1.77 (m, 2 H, $CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 3.20 (t, J=7.3 Hz, 6 H, $CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 3.25 (m, 2 H, $CH_3(CH_2)_8CH_2N^+(CH_2CH_2)_3N$), 3.41 (t, J=7.3 Hz, 6 H, $CH_3(CH_2)_9N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.7 ($CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 22.6, 26.2, 29.0, 29.4, 29.6, 29.8, 31.9 ($CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 21.6 ($CH_3(CH_2)_7CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1

($CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 64.6 ($CH_3(CH_2)_8CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_9N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.

1-undecyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_{11}DABCO][N(CN)_2]$, **3l:**

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, D_2O): δ = 0.88 (t, J=6.0 Hz, 3H, $CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 1.30 (m, 16 H, $CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 1.78 (m, 2 H, $CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 3.22 (t, J=6.3 Hz, 6 H, $CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 3.28 (m, 2 H, $CH_3(CH_2)_9CH_2N^+(CH_2CH_2)_3N$), 3.41 (t, J=6.3 Hz, 6 H, $CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.8 ($CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 22.6, 26.2, 29.0, 29.4, 29.5, 29.6, 29.7, 31.9 ($CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 21.6 ($CH_3(CH_2)_8CH_2CH_2N^+(CH_2CH_2)_3N$), 44.1 ($CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 64.5 ($CH_3(CH_2)_9CH_2N^+(CH_2CH_2)_3N$), 52.1 ($CH_3(CH_2)_{10}N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.

1-dodecyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_{12}DABCO\ N(CN)_2]$, **3m**:

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz, D_2O): δ = 0.89 (t, J=6.3 Hz, 3H, $CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 1.30 (m, 18 H, $CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 1.79 (m, 2 H, $CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 3.23 (t, J=8.3 Hz, 6 H, $CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 3.29 (m, 2 H, $CH_3(CH_2)_{10}CH_2N^+(CH_2CH_2)_3N$), 3.42 (t, J=6.9 Hz, 6 H, $CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz D_2O): δ (ppm) = 13.8 ($CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 22.7, 26.4, 29.2, 29.5, 29.6, 29.7, 29.8, 32.0 ($CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 21.7 ($CH_3(CH_2)_9CH_2CH_2N^+(CH_2CH_2)_3N$), 44.3 ($CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 65.7 ($CH_3(CH_2)_{10}CH_2N^+(CH_2CH_2)_3N$), 52.0 ($CH_3(CH_2)_{11}N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.

1-hexadecyl-4-aza-1-azaniabicyclo[2.2.2]octane dicyanamide, $[C_{16}DABCO][N(CN)_2]$, **3n:**

FT-IR $\nu_{(max)}$: 2223s, 2189s, 2124vs (ν_{CN}) cm^{-1}. ^1H NMR (250 MHz D_2O): δ = 0.86 (t, J=6.3 Hz, 3H, $CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 1.29 (m, 26 H, $CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 1.78 (m, 2 H,

$CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 3.22 (t, J=6.5 Hz, 6 H, $CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 3.26 (m, 2 H, $CH_3(CH_2)_{14}CH_2N^+(CH_2CH_2)_3N$), 3.41 (t, J=5.3 Hz, 6 H, $CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$). ^{13}C NMR (63 MHz, D_2O): δ (ppm) = 13.8 ($CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 22.7, 26.4, 29.2, 29.6, 29.7, 29.9, 30.0, 30.1, 32.0 ($CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 21.7 ($CH_3(CH_2)_{13}CH_2CH_2N^+(CH_2CH_2)_3N$), 44.2 ($CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 64.7 ($CH_3(CH_2)_{14}CH_2N^+(CH_2CH_2)_3N$), 52.2 ($CH_3(CH_2)_{15}N^+(CH_2CH_2)_3N$), 119.9 $[N(CN)_2]^-$.