



Supporting Information

© Wiley-VCH 2005

69451 Weinheim, Germany

**Ambident Reactivity of the Cyanide Ion:  
A Failure of the HSAB Principle**

Alexander A. Tishkov and Herbert Mayr\*

[\*] Prof. Dr. H. Mayr, Dr. A. Tishkov

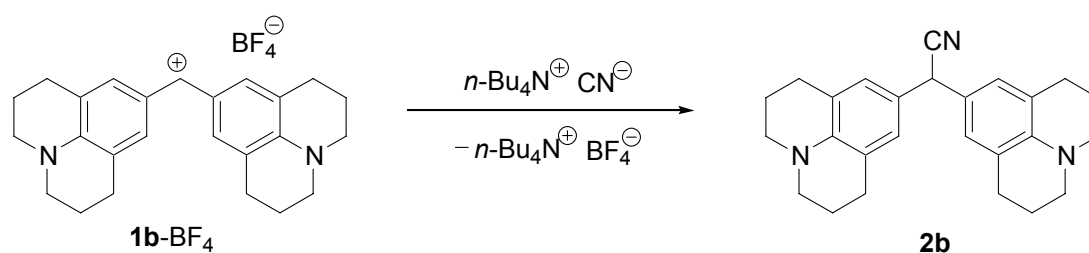
Department Chemie und Biochemie, Ludwig-Maximilians-Universität München

Butenandtstr. 5-13 (Haus F), D-81377 München (Germany)

Fax: (+49) 89-2180-77717

E-mail: [Herbert.Mayr@cup.uni-muenchen.de](mailto:Herbert.Mayr@cup.uni-muenchen.de)

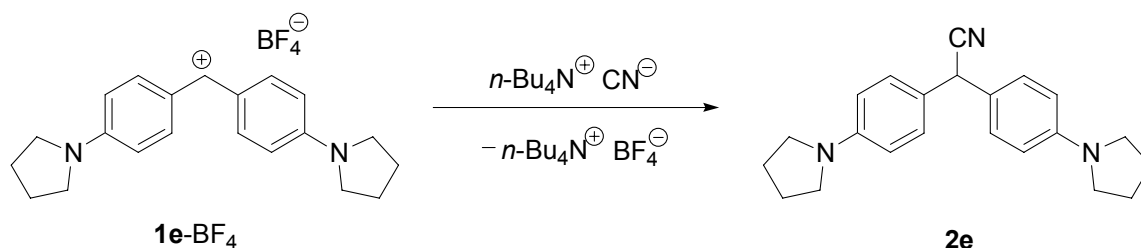
### Synthesis of bis(julolidin-9-yl)acetonitrile **2b**



To a stirred solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (54 mg, 0.20 mmol) in dry MeCN (4 mL) a solution of **1b-BF<sub>4</sub>** (0.04 g, 0.1 mmol) in dry MeCN (1 mL) was added dropwise. The solvent was removed in vacuum and the residue was extracted with Et<sub>2</sub>O (3 × 5 mL). The combined extracts were filtered through Celite and evaporated in vacuum to give a crude product, which contained **2b** and traces of an unidentified substance (<sup>1</sup>H NMR control). Column chromatography (silica gel, EtOAc/*n*-hexane 1 : 5 + Et<sub>3</sub>N (5 % v/v)) provided pure **2b** as colorless oil (35 mg, 90 %).

<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ = 1.85 (m, 8 H), 2.62 (t, 8 H,  $J = 6.5$  Hz), 3.02 (t, 8 H,  $J = 5.5$  Hz), 4.64 (s, 1 H, Ar<sub>2</sub>CH), 6.62 (s, 4 H). <sup>13</sup>C NMR (75.5 MHz, CDCl<sub>3</sub>): δ = 21.9 (CH<sub>2</sub>), 27.6 (CH<sub>2</sub>), 41.2 (Ar<sub>2</sub>CH), 49.9 (CH<sub>2</sub>), 121.2 (C<sub>q</sub>), 121.8 (C<sub>q</sub>), 123.5 (CN), 126.0 (CH), 142.4 (C<sub>q</sub>). MS (EI),  $m/z$  (%): 383 (M<sup>+</sup>, 100); HRMS (EI) calcd for C<sub>26</sub>H<sub>29</sub>N<sub>3</sub>: 383.2355; found: 383.2333.

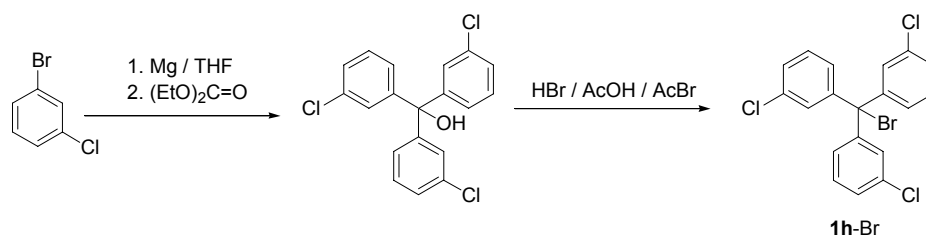
### Synthesis of bis[4-(*N*-pyrrolidino)phenyl]acetonitrile **2e**



To a stirred solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (54 mg, 0.20 mmol) in dry MeCN (4 mL) a solution of **1e-BF<sub>4</sub>** (0.04 g, 0.1 mmol) in dry MeCN (1 mL) was added dropwise. The solvent was removed in vacuum and the residue was extracted with Et<sub>2</sub>O (3 × 5 mL). The combined extracts were filtered through Celite and evaporated in vacuum to give a crude product, which contained **2e** and traces of an unidentified substance. Column chromatography (silica gel, EtOAc/*n*-hexane 1 : 5 + Et<sub>3</sub>N (5 % v/v)) provided **2e** as white powder (27 mg, 82 %); mp. 148–150 °C (*n*-hexane/EtOAc).

<sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ = 1.92 (m, 8 H), 3.19 (m, 8 H), 4.90 (s, 1 H, Ar<sub>2</sub>CH), 6.44 (d, 4 H,  $J = 8.7$  Hz), 7.08 (d, 4 H,  $J = 8.7$  Hz). <sup>13</sup>C NMR (75.5 MHz, CDCl<sub>3</sub>): δ = 25.4 (CH<sub>2</sub>), 40.9 (Ar<sub>2</sub>CH), 47.6 (CH<sub>2</sub>), 111.8 (CH), 121.0 (C<sub>q</sub>), 123.2 (CN), 128.5 (CH), 147.4 (C<sub>q</sub>). MS (EI),  $m/z$  (%): 331 (M<sup>+</sup>, 100); HRMS (EI) calcd for C<sub>22</sub>H<sub>25</sub>N<sub>3</sub>: 331.2043; found: 331.2051.

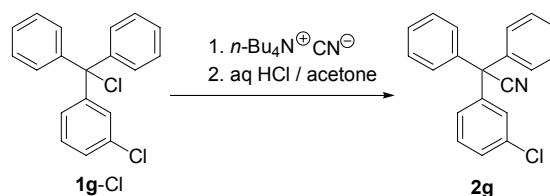
### Synthesis of bromo-tris(3-chlorophenyl)methane **1h-Br**



To magnesium turnings (0.80 g, 33 mmol) in dry THF (20 mL) one fourth of a solution of 3-bromo-chlorobenzene (3.60 mL, 30.7 mmol) in dry THF (20 mL) was added. The exothermic reaction started after a few minutes. The rest of the halogenated arene was slowly added to the reaction mixture, maintaining a gentle boiling. After the addition, the reaction mixture was refluxed for 1 h and cooled to ambient temperature. To the resultant brown solution of the Grignard reagent, (EtO)<sub>2</sub>CO (0.75 mL, 6.2 mmol) in dry THF (5 mL) was added dropwise, refluxed for 1 h, and quenched after cooling with a cold saturated aqueous solution of NH<sub>4</sub>Cl. Et<sub>2</sub>O was added, the organic layer was separated and successively washed with a saturated aqueous solution of NH<sub>4</sub>Cl, water, and brine, dried over CaSO<sub>4</sub> and concentrated in vacuum at 100 °C/0.05 mbar. The resultant crude tris(3-chlorophenyl)methanol was dissolved in 33 wt. % solution of HBr in AcOH (4.64 mL, 25.6 mmol). After 1 h of reflux, acetyl bromide (0.92 mL, 12 mmol) was added. After refluxing for 1 h, the volatile components were removed in vacuum and the residue was recrystallized from *n*-hexane to give **1h-Br** (1.57 g, 60 % with respect to (EtO)<sub>2</sub>CO) as a brownish powder; mp 88–90 °C (*n*-hexane).

<sup>1</sup>H NMR (300 MHz, C<sub>6</sub>D<sub>6</sub>): δ = 6.57 (t, 3 H, *J* = 7.8 Hz), 6.87 (dd, 3 H, *J* = 7.8, 2.0 Hz), 7.44 (t, 3 H, *J* = 2.0 Hz). <sup>13</sup>C NMR (75.5 MHz, CDCl<sub>3</sub>): δ = 74.2 (C<sub>q</sub>), 128.5 (CH), 128.57 (CH), 130.1 (CH), 134.1 (C<sub>q</sub>), 146.4 (C<sub>q</sub>). MS (EI), *m/z* (%): 347 (M<sup>+</sup>-Br, 37), 345 (M<sup>+</sup>-Br, 38). Anal. calcd for C<sub>19</sub>H<sub>12</sub>BrCl<sub>3</sub>: C 53.50, H 2.84; found: C 53.64, H 3.10.

### Synthesis of 3-chlorophenyl-diphenylacetonitrile **2g**

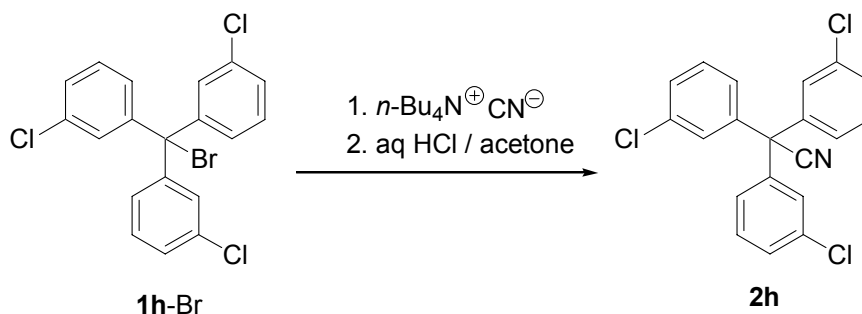


To a stirred solution of *n*-Bu<sub>4</sub>N<sup>+</sup>CN<sup>-</sup> (0.81 g, 3.3 mmol) in dry acetonitrile (30 mL) **1g-Cl**<sup>[S1]</sup> (0.34 g, 1.1 mmol) in dry benzene (1 mL) was added. After stirring for 15 min, the reaction mixture was evaporated in vacuum. The residue was extracted with *n*-hexane (5 × 5 mL), and *n*-hexane was removed in vacuum to give a mixture of **2g** (85 %) and **3g** (15 %). The isocyanide **3g** was hydrolyzed by refluxing this mixture with 6 M HCl (2 mL) in acetone (10 mL) for 10 min. Acetone was then evaporated, and the aqueous residue was extracted with Et<sub>2</sub>O. The organic layer was washed successively with a saturated aqueous solution of NaHCO<sub>3</sub>, water, and brine, evaporated in vacuum and the residue, a mixture of **2g** and 3-chlorophenyl-diphenylmethanol, was subjected to a flash chromatography (silica gel, EtOAc/*n*-hexane 1 : 5 + Et<sub>3</sub>N (2 %)) to give **2g** (0.20 g, 66 %) as a sticky colorless oil.

<sup>1</sup>H NMR (300 MHz, C<sub>6</sub>D<sub>6</sub>): δ = 6.64 (td, 1 H, *J* = 8.0, 0.4 Hz), 6.92 – 7.0 (m, 7 H), 7.02 (ddd, 1 H, *J* = 8.0, 2.0, 1.0 Hz), 7.30 (td, 1 H, *J* = 2.0, 0.4 Hz); <sup>13</sup>C NMR (75.5 MHz, CDCl<sub>3</sub>): δ = 57.2 (C<sub>q</sub>), 122.9 (CN), 127.1 (CH), 128.4 (CH), 128.5 (CH), 128.7 (CH), 128.9 (CH), 129.0 (CH), 129.9 (CH), 134.8 (C<sub>q</sub>), 139.5 (C<sub>q</sub>), 142.3 (C<sub>q</sub>). MS (EI), *m/z* (%): 305 (M<sup>+</sup>, 34), 303 (M<sup>+</sup>, 100); IR (CCl<sub>4</sub>): ν (CN) = 2240. Anal. calcd for C<sub>20</sub>H<sub>14</sub>CIN: C 79.07, H 4.65, N 4.61; found: C 79.12, H 4.64, N 4.53.

<sup>[S1]</sup> C. S. Marvel, F. C. Dietz, C. M. Himel, *J. Org. Chem.* **1942**, *7*, 392–397.

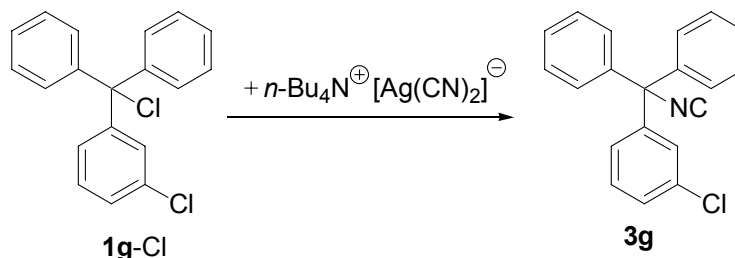
### Synthesis of tris(3-chlorophenyl)acetonitrile (**2h**)



To a stirred solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (0.19 g, 0.70 mmol) in dry acetonitrile (100 mL) **1h-Br** (0.20 g, 0.47 mmol) in dry benzene (2 mL) was added. After stirring for 1 h, the reaction mixture was evaporated in vacuum. The residue was extracted with  $n$ -hexane ( $5 \times 10$  mL), and hexane was removed in vacuum to give a mixture of **2g** and **3h**. The isocyanide **3h** was decomposed by refluxing this mixture with 6 M HCl (2 mL) in acetone (10 mL) for 10 min. Acetone was then evaporated, and the aqueous residue was extracted with  $\text{Et}_2\text{O}$ . The organic layer was washed successively with a saturated aqueous solution of  $\text{NaHCO}_3$ , water, and brine, evaporated in vacuum and the residue was subjected to a flash chromatography (silica gel,  $\text{EtOAc}/n$ -hexane 1 : 10 +  $\text{Et}_3\text{N}$  (2 % v/v)) to give **2h** (0.08 g, 46 %) as a sticky colorless oil.

$^1\text{H}$  NMR (300 MHz,  $\text{C}_6\text{D}_6$ ):  $\delta$  = 6.57 (td, 3 H,  $J$  = 8.0, 0.3 Hz), 6.78 (ddd, 3 H,  $J$  = 8.0, 2.0, 1.0 Hz), 6.88 (ddd, 3 H,  $J$  = 8.0, 2.0, 1.0 Hz), 7.22 (td, 1 H,  $J$  = 2.0, 0.3 Hz).  $^{13}\text{C}$  NMR (75.5 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 56.5 ( $\text{C}_q$ ), 121.9 (CN), 126.9 (CH), 128.7 (CH), 129.1 (CH), 130.2 (CH), 135.2 ( $\text{C}_q$ ), 140.8 ( $\text{C}_q$ ). MS (EI),  $m/z$  (%): 373 ( $\text{M}^+$ , 69), 371 ( $\text{M}^+$ , 71), 262 ( $\text{C}_{14}\text{H}_8\text{Cl}_2\text{N}^+$ , 38), 260 ( $\text{C}_{14}\text{H}_8\text{Cl}_2\text{N}^+$ , 57), 224 (68), 190 (100); IR ( $\text{CCl}_4$ ):  $\nu(\text{CN}) = 2242 \text{ cm}^{-1}$ . Anal. calcd for  $\text{C}_{20}\text{H}_{12}\text{Cl}_3\text{N}$ : C 64.46, H 3.25, N 3.76; found: C 64.59, H 3.70, N 3.63.

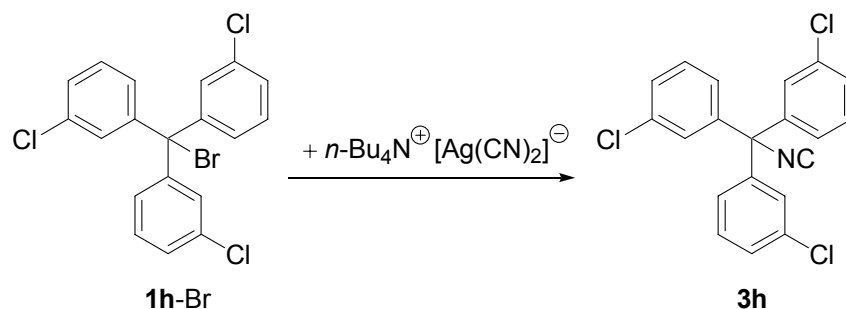
### Synthesis of isocyano-3-chlorophenyl-diphenylmethane **3g**



To a stirred suspension of  $\text{AgCN}$  (0.12 mg, 0.90 mmol) in dry acetonitrile (10 mL) a solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (0.22 g, 0.82 mmol) in dry acetonitrile (2 mL) was added. The mixture was stirred for 1 h, and **1g-Cl** (0.17 g, 0.54 mmol) in dry benzene (1 mL) was added. After stirring for 1 h, the reaction mixture was evaporated in vacuum. The residue was extracted with  $n$ -hexane ( $10 \times 10$  mL),  $n$ -hexane was removed in vacuum, and the residue was subjected to flash chromatography (silica gel,  $\text{EtOAc}/n$ -hexane 1 : 10 +  $\text{Et}_3\text{N}$  (2 % v/v)) to give **3g** (0.14 g, 83 %, contains traces of isomeric nitrile, that has been formed during the chromatography) as a sticky colorless oil.

$^1\text{H}$  NMR (300 MHz,  $\text{C}_6\text{D}_6$ ):  $\delta$  = 6.66 (td, 1 H,  $J$  = 8.0, 0.4 Hz), 6.89 – 6.98 (m, 7 H), 7.02 (ddd, 1 H,  $J$  = 8.0, 2.0, 1.0 Hz), 7.09 – 7.16 (m, 4 H), 7.35 (td, 1 H,  $J$  = 2.0, 0.4 Hz).  $^{13}\text{C}$  NMR (75.5 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 74.5 ( $\text{C}_q$ ), 126.4 (CH), 128.5 (CH), 128.53 (CH), 128.7 (CH), 128.8 (CH), 128.81 (CH), 129.8 (CH), 134.5 ( $\text{C}_q$ ), 140.9 ( $\text{C}_q$ ), 143.6 ( $\text{C}_q$ ), 158.3 (NC). IR ( $\text{CCl}_4$ ):  $\nu(\text{NC}) = 2126 \text{ cm}^{-1}$ . MS (EI),  $m/z$  (%): 305 ( $\text{M}^+$ , 27), 303 ( $\text{M}^+$ , 82), 279 ( $\text{C}_{19}\text{H}_{14}\text{Cl}^+$ , 34), 277 ( $\text{C}_{19}\text{H}_{14}\text{Cl}^+$ , 100); HRMS (EI) calcd for  $\text{C}_{20}\text{H}_{14}\text{ClN}$ : 303.0812; found: 303.0844.

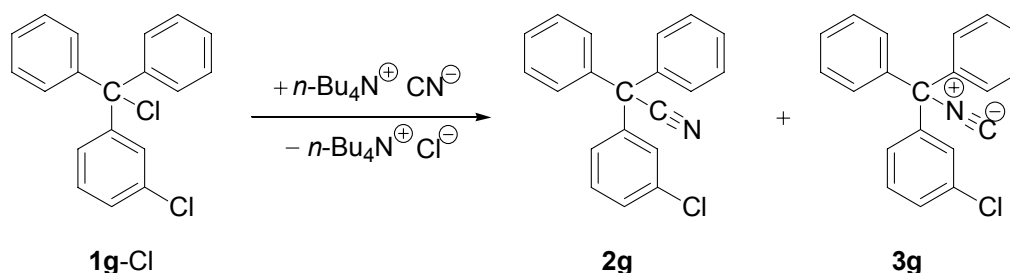
### Synthesis of isocyano-tris(3-chlorophenyl)methane **3h**



To AgCN (0.19 g, 1.4 mmol) a solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (0.28 g, 1.0 mmol) in dry acetonitrile (20 mL) was added. After stirring for 1 h, **1h-Br** (0.30 g, 0.70 mmol) in dry benzene (1 mL) was added. The reaction mixture was stirred for 1 h at ambient temperature, evaporated in vacuum. The residue was extracted with *n*-hexane ( $3 \times 10$  mL). *n*-Hexane was removed in vacuum and crude product was subjected to flash chromatography (silica gel, EtOAc/*n*-hexane 1 : 7 + Et<sub>3</sub>N (2 % v/v)) to give **3h** (0.21 g, 79 %) as a sticky colorless oil.

<sup>1</sup>H NMR (300 MHz, C<sub>6</sub>D<sub>6</sub>):  $\delta$  = 6.56 (t, 3 H,  $J$  = 8.0 Hz), 6.76 (ddd, 3 H,  $J$  = 8.0, 2.0, 1.0 Hz), 6.88 (ddd, 3 H,  $J$  = 8.0, 2.0, 1.0 Hz), 7.25 (t, 1 H,  $J$  = 2.0 Hz). <sup>13</sup>C NMR (75.5 MHz, CDCl<sub>3</sub>):  $\delta$  = 73.6 (C<sub>q</sub>), 126.2 (CH), 128.1 (CH), 129.2 (CH), 129.9 (CH), 134.9 (C<sub>q</sub>), 142.3 (C<sub>q</sub>), 159.8 (NC). MS (EI):  $m/z$  (%) 373 (M<sup>+</sup>, 96), 371 (M<sup>+</sup>, 97), 262 (C<sub>14</sub>H<sub>8</sub>Cl<sub>2</sub>N<sup>+</sup>, 38), 260 (C<sub>14</sub>H<sub>8</sub>Cl<sub>2</sub>N<sup>+</sup>, 57). IR (CCl<sub>4</sub>):  $\nu$  (NC) = 2125 cm<sup>-1</sup>. Anal. calcd for C<sub>20</sub>H<sub>12</sub>Cl<sub>3</sub>N: C 64.46, H 3.25, N 3.76; found: C 64.62, H 3.45, N 3.63.

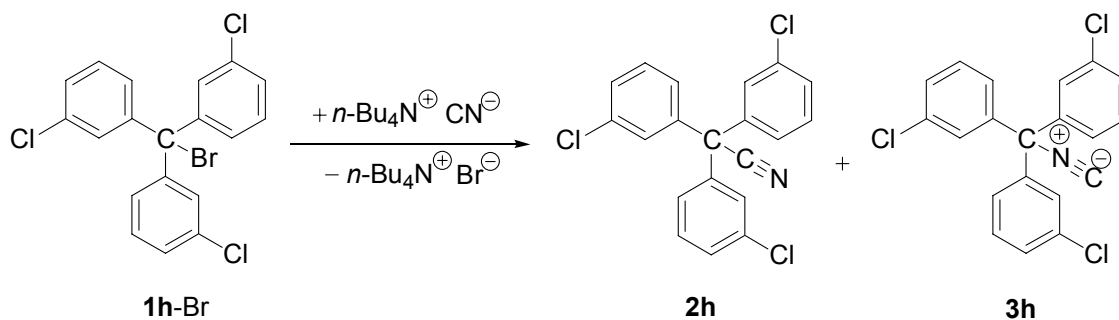
### Reaction of chloro-(3-chlorophenyl)-diphenylmethane **1g-Cl** with tetra-*n*-butylammonium cyanide ( $[n\text{-Bu}_4\text{N}^+\text{CN}^-] = 7.1 \times 10^{-3}$ M, $[\text{1g-Cl}] = 4.7 \times 10^{-3}$ M)



To a stirred solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (0.64 g, 2.4 mmol) in dry MeCN (100 mL) a solution of **1g-Cl** (0.15 g, 0.48 mmol) in dry benzene (1 mL) was added at 20 °C. After 1 h of stirring at 20 °C, the reaction mixture was evaporated and the residue was extracted with *n*-hexane ( $10 \times 5$  mL). The combined *n*-hexane extracts were filtered through Celite and evaporated in vacuum to give a mixture of **2g** and **3g** in a ratio 5.8 : 1 (0.14 mg, 98 %).

The components of the product mixture have been identified by comparison of their <sup>1</sup>H, <sup>13</sup>C NMR, and IR spectra with the spectra of pure **2g** and **3g** (see Figure 1).

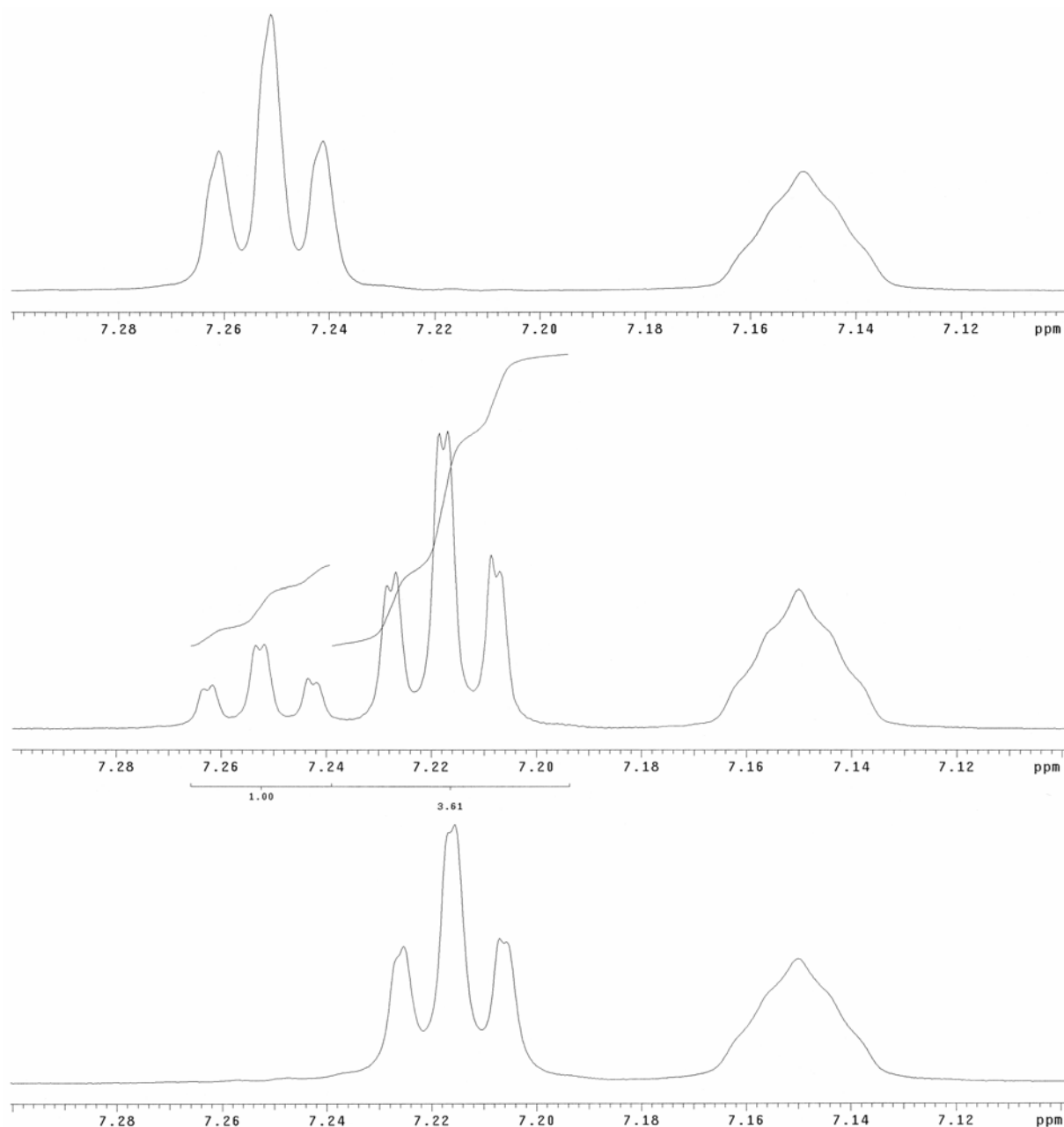
**Reaction of bromo-tris(3-chlorophenyl)methane **1h-Br** with tetra-*n*-butylammonium cyanide**  
( $[n\text{-Bu}_4\text{N}^+\text{CN}^-] = 7.1 \times 10^{-3} \text{ M}$ ,  $[\mathbf{1h-Br}] = 4.7 \times 10^{-3} \text{ M}$ )



To a stirred solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (0.19 g, 0.71 mmol) in dry MeCN (100 mL) a solution of **1h-Br** (0.20 g, 0.47 mmol) in dry benzene (1 mL) was added at 20 °C. After 1 h of stirring at 20 °C, the reaction mixture was evaporated and the residue was extracted with *n*-hexane ( $10 \times 5 \text{ mL}$ ). The combined hexane extracts were filtered through Celite and evaporated in vacuum to give a mixture of **2h** and **3h** in a ratio 3.7 : 1 (0.17 g, 96 %).

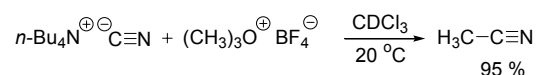
The components of the product mixture were identified by comparison of their  $^1\text{H}$ ,  $^{13}\text{C}$  NMR, and IR spectra with the spectra of pure **2h** and **3h** (Figure S1).

The same product ratio was obtained, when the reaction was carried out with  $[n\text{-Bu}_4\text{N}^+\text{CN}^-] = 2.4 \times 10^{-2} \text{ M}$  and  $[\mathbf{1h-Br}] = 4.7 \times 10^{-3} \text{ M}$ .



**Figure S1.** Comparison of the  $^1\text{H}$  NMR spectrum (200 MHz,  $\text{C}_6\text{D}_6$ ) of the product obtained from the reaction of **1h-Br** with  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (middle) with that of pure isocyanide **3h** (top) and nitrile **2h** (bottom).

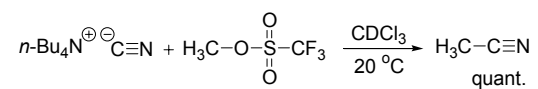
#### Reaction of trimethyloxonium tetrafluoroborate with tetra-*n*-butylammonium cyanide



To solid  $\text{Me}_3\text{O}^+\text{BF}_4^-$  (15 mg, 0.10 mmol) a solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (90 mg, 0.34 mmol) in  $\text{CDCl}_3$  (1 mL) and standard (0.05 mL of 1.39 M solution of  $\text{CH}_2\text{Cl}_2$  in  $\text{CCl}_4$ ) was added. After the dissolution of  $\text{Me}_3\text{O}^+\text{BF}_4^-$  (ca. 10 min) the  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were taken, which showed the peaks of  $\text{MeCN}$  [ $^1\text{H}$  NMR (200 MHz,  $\text{CDCl}_3$ )  $\delta = 1.94$  ppm, yield 95 %,  $^{13}\text{C}$  NMR (75.5 MHz,  $\text{CDCl}_3$ )  $\delta = 1.8$  ( $\text{CH}_3$ ), 116.5 ( $\text{CN}$ )] and  $\text{Me}_2\text{O}$  [ $^1\text{H}$  NMR:  $\delta = 3.21$  ppm, yield 95 %,  $^{13}\text{C}$  NMR:  $\delta = 60.4$  ( $\text{CH}_3$ )]. No peaks of  $\text{MeNC}$  [ $^1\text{H}$  NMR:  $\delta = 2.85$  ppm;  $^{13}\text{C}$  NMR:  $\delta = 26.8$  ( $\text{CH}_3$ ), 158.2 ( $\text{NC}$ )] could be detected.

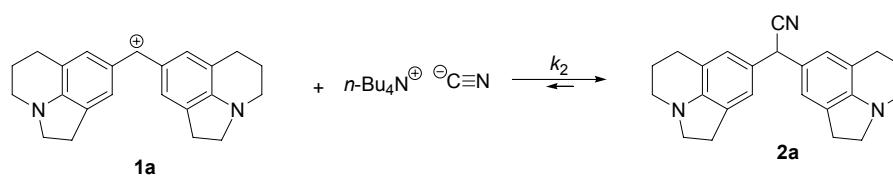


### Reaction of methyl triflate with tetra-*n*-butylammonium cyanide

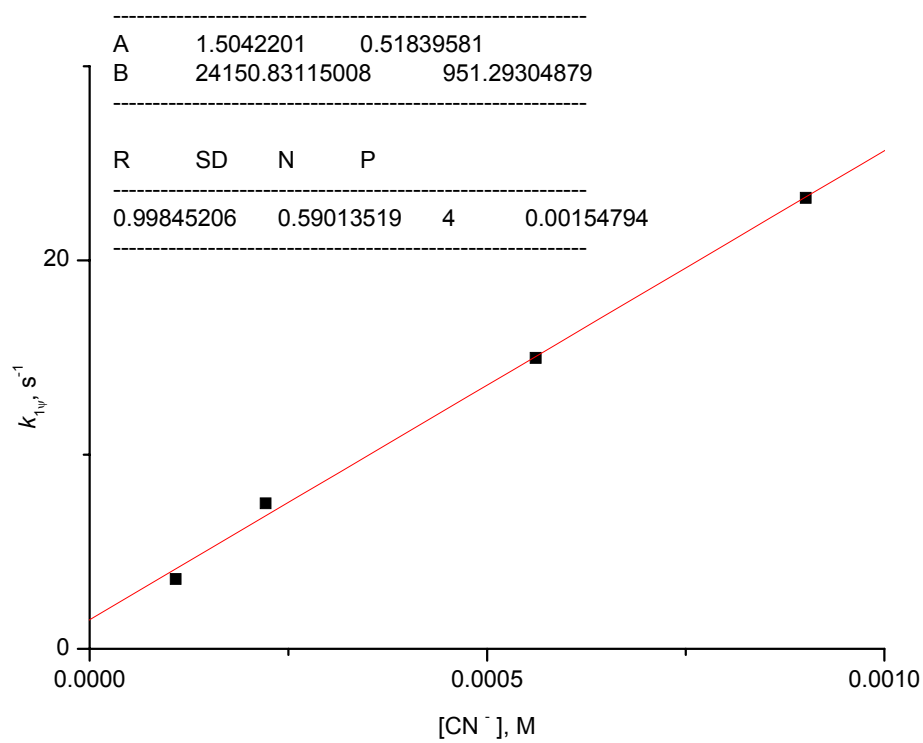


To a solution of  $n\text{-Bu}_4\text{N}^+\text{CN}^-$  (90 mg, 0.34 mmol) in  $\text{CDCl}_3$  (1 mL) neat MeOTf (20 mg, 0.12 mmol) and standard (0.05 mL of 1.39 M solution of  $\text{CH}_2\text{Cl}_2$  in  $\text{CCl}_4$ ) was added. After 5 min  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were taken, which showed the peaks of MeCN. No peaks of MeNC could be detected.

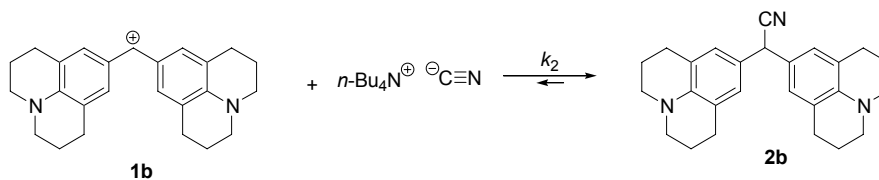
**Rate constants for the reactions of benzhydrylium tetrafluoroborates with tetra-*n*-butylammonium cyanide in acetonitrile (20 °C, stopped-flow)**



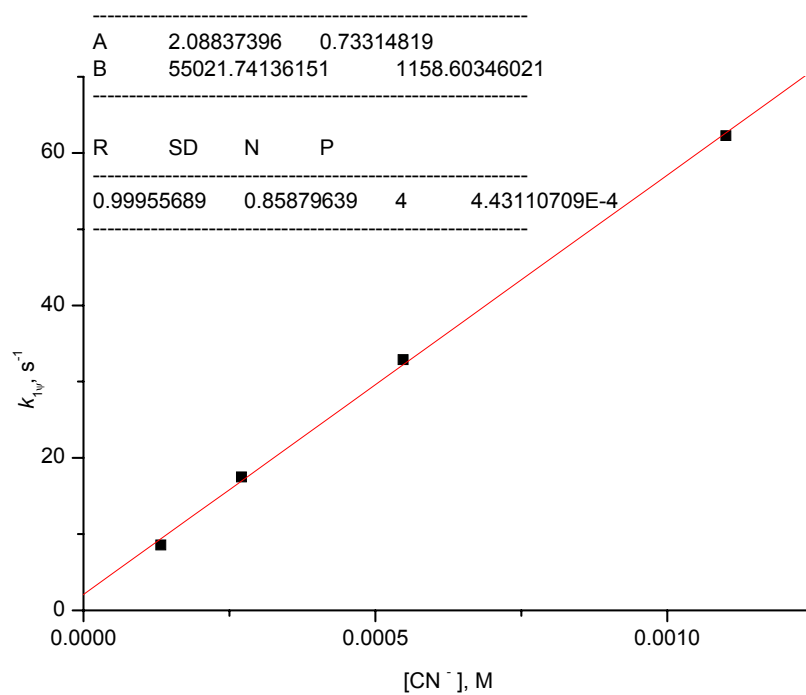
$[\text{Ar}_2\text{CH}^+]_0, \text{M}$	$[\text{CN}^-]_0, \text{M}$	$k_{\text{obs}}(20\text{ }^\circ\text{C}), \text{s}^{-1}$
$1.01 \times 10^{-5}$	$1.133 \times 10^{-4}$	3.60
$1.01 \times 10^{-5}$	$2.265 \times 10^{-4}$	7.50
$1.01 \times 10^{-5}$	$5.663 \times 10^{-4}$	14.98
$1.01 \times 10^{-5}$	$9.061 \times 10^{-4}$	23.22
$1.01 \times 10^{-5}$	$1.812 \times 10^{-3}$	42.17

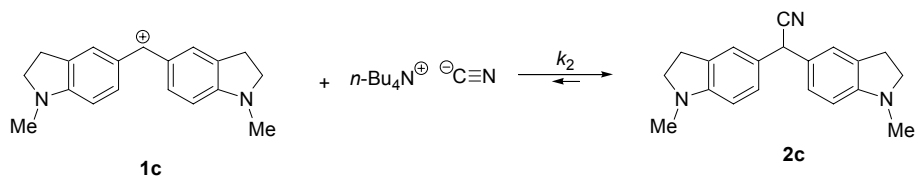


$$k_2(20\text{ }^\circ\text{C}) = 2.42 \times 10^4 \text{ M}^{-1} \text{ s}^{-1}$$

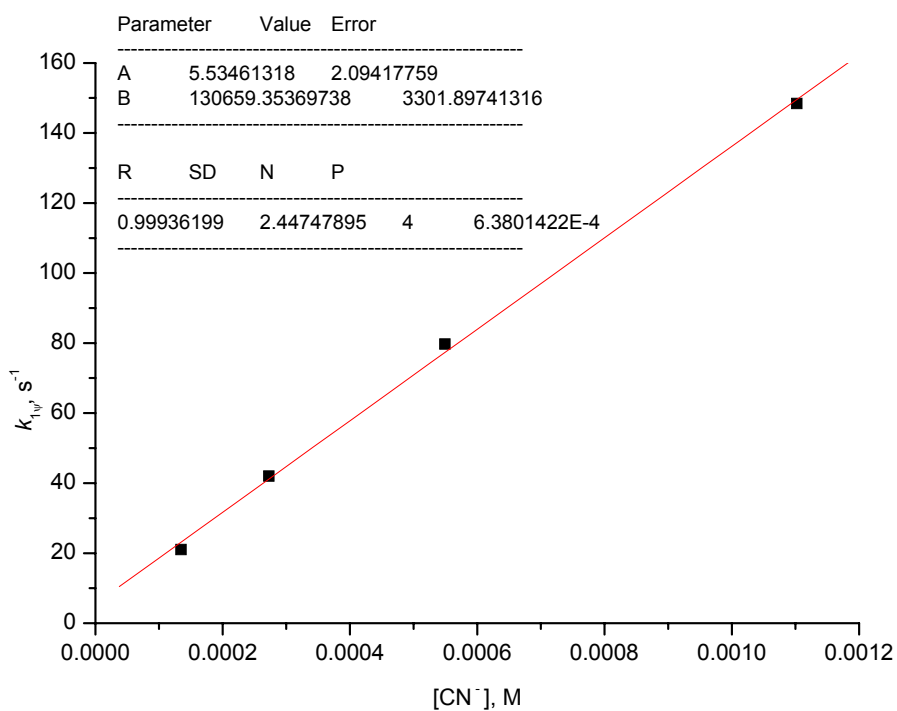


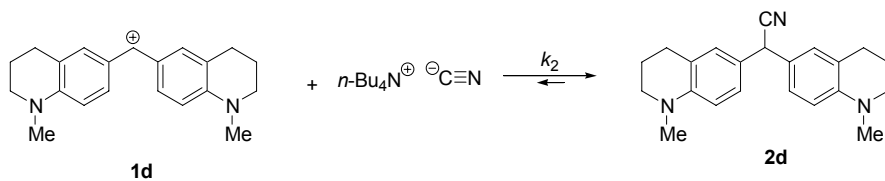
$[\text{Ar}_2\text{CH}^+]_0, \text{M}$	$[\text{CN}^-]_0, \text{M}$	$k_{\text{obs}}(20\text{ }^\circ\text{C}), \text{s}^{-1}$
$1.13 \times 10^{-5}$	$1.383 \times 10^{-4}$	8.58
$1.13 \times 10^{-5}$	$2.766 \times 10^{-4}$	17.5
$1.13 \times 10^{-5}$	$5.532 \times 10^{-4}$	32.9
$1.13 \times 10^{-5}$	$1.106 \times 10^{-3}$	62.3



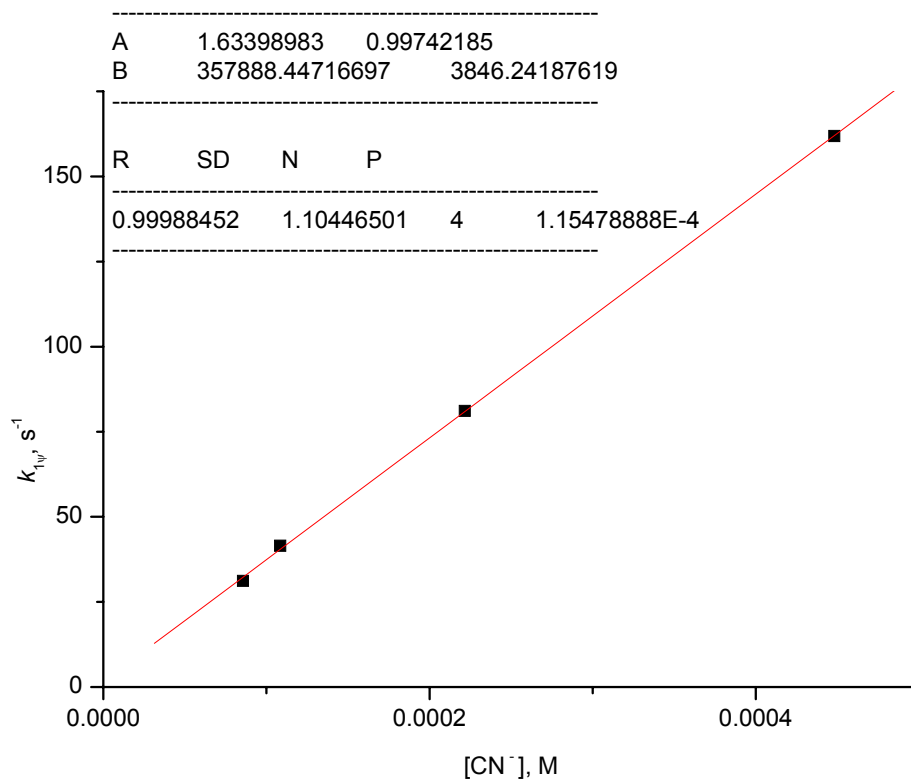


$[\text{Ar}_2\text{CH}^+]_0, \text{M}$	$[\text{CN}^-]_0, \text{M}$	$k_{\text{obs}}(20\text{ }^\circ\text{C}), \text{s}^{-1}$
$7.69 \times 10^{-6}$	$1.383 \times 10^{-4}$	21.0
$7.69 \times 10^{-6}$	$2.766 \times 10^{-4}$	42.0
$7.69 \times 10^{-6}$	$5.532 \times 10^{-4}$	79.8
$7.69 \times 10^{-6}$	$1.106 \times 10^{-3}$	148.5

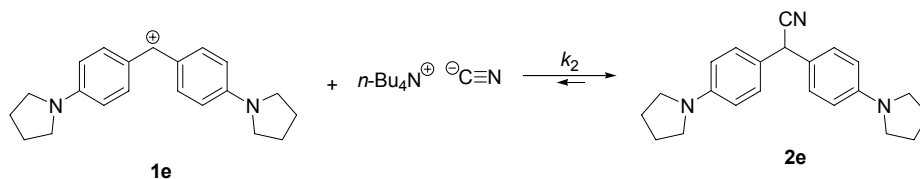




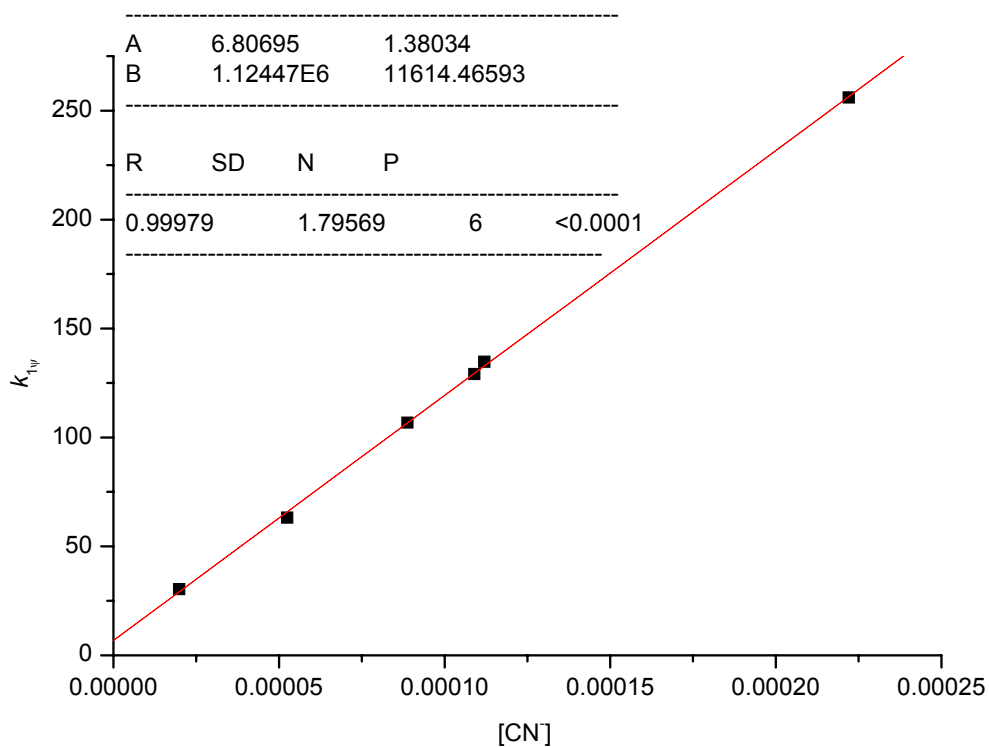
$[\text{Ar}_2\text{CH}^+]_0, \text{M}$	$[\text{CN}^-]_0, \text{M}$	$k_{\text{obs}}(20\text{ }^\circ\text{C}), \text{s}^{-1}$
$9.79 \times 10^{-6}$	$9.060 \times 10^{-5}$	31.19
$9.79 \times 10^{-6}$	$1.133 \times 10^{-4}$	41.50
$9.79 \times 10^{-6}$	$2.265 \times 10^{-4}$	81.12
$9.79 \times 10^{-6}$	$4.530 \times 10^{-4}$	161.9



$$k_2(20\text{ }^\circ\text{C}) = 3.58 \times 10^5 \text{ M}^{-1} \text{ s}^{-1}$$



$[\text{Ar}_2\text{CH}^{\oplus}]_0, \text{M}$	$[\text{CN}^-]_0, \text{M}$	$k_{\text{obs}}(20\text{ }^{\circ}\text{C}), \text{s}^{-1}$
$3.672 \times 10^{-6}$	$2.174 \times 10^{-5}$	30.44
$3.672 \times 10^{-6}$	$5.436 \times 10^{-5}$	63.16
$3.672 \times 10^{-6}$	$9.060 \times 10^{-5}$	106.81
$3.672 \times 10^{-6}$	$1.133 \times 10^{-4}$	134.03
$9.180 \times 10^{-6}$	$1.133 \times 10^{-4}$	129.11
$9.180 \times 10^{-6}$	$2.265 \times 10^{-4}$	256.03



$$k_2(20\text{ }^{\circ}\text{C}) = 1.125 \times 10^6 \text{ M}^{-1} \text{ s}^{-1}$$