ACTIVITY OF INDIVIDUAL IONS IN AQUEOUS MIXTURES SOLUTIONS

Raw Data of Potentials in mV Measured with Ion Selective Electrodes against a Single
Junction Reference Electrode at 298.15 K.

Data measured at the Thermodynamic Laboratory,
Department of Chemical Engineering, McGill University,
under the direction of Professor Juan H. Vera.

These data were quoted in the following publication:

Eva Rodil, Alberto Arce, Grazyna Wilczek-Vera, Juan H. Vera, “**Measurement of ion activity coefficients in aqueous solutions of mixed electrolyte with a common ion: $\text{NaNO}_3 + \text{KNO}_3$, $\text{NaCl} + \text{KCl}$ and $\text{NaBr} + \text{NaCl}$** ”, *Journal of Chemical and Engineering Data*, Robin H. Stokes Festschrift

Correspondence to be addressed to;

Juan H. Vera
Department of Chemical Engineering
McGill University
3610 University street
Montreal, Quebec, H3A 2B2. Canada

e-mail: juan.vera@mcgill.ca

System	Page
1. $\text{NaNO}_3 + \text{KNO}_3$	3
2. $\text{NaCl} + \text{KCl}$	5
3. $\text{NaBr} + \text{NaCl}$	6

System 1: $\text{NaNO}_3 + \text{KNO}_3$

Measured by: Eva Rodil and Mar Marcos-Arroyo

Explanation of Symbols:

- m - molality of total electrolyte
 E_{Na^+} - potential in mV for cation Na^+
 $E_{\text{NO}_3^-}$ - potential in mV for anion NO_3^-

$$X_{\text{Na}^+} = m_{\text{Na}^+} / (m_{\text{Na}^+} + m_{\text{K}^+})$$

	$X_{\text{Na}^+} = 3/4$		$X_{\text{Na}^+} = 1/2$		$X_{\text{Na}^+} = 1/4$	
	run 1	run 2	run 3	run 4	run 5	run 6
m	$E_{\text{NO}_3^-}$ (mV)	$E_{\text{NO}_3^-}$ (mV)	$E_{\text{NO}_3^-}$ (mV)	$E_{\text{NO}_3^-}$ (mV)	$E_{\text{NO}_3^-}$ (mV)	$E_{\text{NO}_3^-}$ (mV)
0.002	158.0	-	163.0	-	159.3	-
0.004	141.5	151.4	144.9	153.1	141.9	151.7
0.006	132.0	-	135.4	-	132.1	-
0.008	125.2	134.8	128.2	136.7	126.3	135.2
0.01	119.9	-	123.4	-	121.0	-
0.012	-	125.2	-	126.8	-	125.6
0.016	-	118.5	-	120.0	-	118.8
0.03	92.4	-	98.7	-	93.9	-
0.07	75.3	-	79.9	-	76.8	-
0.1	68.1	-	72.2	-	69.6	-
0.2	54.3	-	57.8	-	55.7	-
0.4	41.3	49.8	44.3	51.3	42.8	50.2
0.6	34.1	-	37.1	-	35.8	-
0.8	29.3	37.9	32.2	39.5	31.2	38.5
1.0	26.0	-	28.7	-	27.9	-
1.2	23.4	31.7	26.0	34.0	25.4	32.7
1.4	21.3	-	23.9	-	23.5	-
1.6	19.6	28.0	22.2	29.1	22.0	29.2
1.8	18.1	-	20.8	-	20.7	-
2.0	16.9	25.4	19.6	26.2	19.7	26.9
2.2	15.8	-	18.5	-	18.7	-
2.4	14.6	23.5	17.6	24.0	17.9	25.2

Continues in the next page.

System 1: $\text{NaNO}_3 + \text{KNO}_3$

Measured by: Eva Rodil and Mar Marcos-Arroyo

Explanation of Symbols:

- m - molality of total electrolyte
 E_{Na^+} - potential in mV for cation Na^+
 $E_{\text{NO}_3^-}$ - potential in mV for anion NO_3^-
 $-X_{\text{Na}^+} = m_{\text{Na}^+} / (m_{\text{Na}^+} + m_{\text{K}^+})$

	$X_{\text{Na}^+} = 1$		$X_{\text{Na}^+} = 0$			
	run 7*		run 8*			
m	$E_{\text{NO}_3^-}$ (mV)	E_{Na^+} (mV)	$E_{\text{NO}_3^-}$ (mV)			
0.002	159.8	147.8	157.6			
0.003	148.9	158.5	147.6			
0.004	141.8	165.8	140.7			
0.005	136.9	171.1	135.3			
0.006	132.5	175.4	131.6			
0.007	128.8	179.3	127.9			
0.008	125.8	182.2	124.9			
0.01	120.8	187.1	119.5			
0.03	95.7	212.5	94.8			
0.05	84.4	224.6	83.4			
0.07	76.9	232.8	76.1			
0.1	69.1	241.5	68.4			
0.2	54.6	258.8	54.5			
0.3	46.4	268.7	46.6			
0.4	41.0	275.8	41.3			
0.6	33.4	286.0	34.3			
0.8	28.6	293.3	29.9			
0.9	25.1	299.3	28.2			
1.0	22.4	304.1	-			
1.2	20.1	308.0	27.0			
1.4	18.3	311.4	24.8			
1.6	16.8	314.6	22.9			
1.8	15.4	317.5	21.5			
2.0	12.5	323.2	20.3			
2.5	10.6	328.4	19.3			
3.0	159.8	147.8	17.2			
3.5	148.9	158.5	-			

* The runs for $X_{\text{Na}^+} = 1$ and $X_{\text{Na}^+} = 0$ are already deposited in *ACTIVITY OF INDIVIDUAL IONS IN AQUEOUS SOLUTIONS, 2004*.

System 2: NaBr + NaCl

Measured by: Eva Rodil

Explanation of Symbols:

- m - molality of total electrolyte
- E_{Na^+} - potential in mV for cation Na^+
- E_{Cl^-} - potential in mV for cation Cl^-
- $X_{Cl^-} = m_{Cl^-} / (m_{Cl^-} + m_{Br^-})$

	$X_{Na^+} = 3/4$				$X_{Na^+} = 1/2$	
	run 1		run 2		run 3	
m	E_{Cl^-} (mV)	E_{K^+} (mV)	E_{Cl^-} (mV)	E_{K^+} (mV)	E_{Cl^-} (mV)	E_{K^+} (mV)
0.004	161.3	-69.8	159.9	-69.9	159.7	-56.0
0.008	144.5	-52.2	143.5	-53.5	143.0	-39.1
0.012	135.1	-42.2	133.9	-43.7	132.7	-29.2
0.016	128.5	-35.6	127.5	-36.4	125.7	-21.6
0.2	70.6	24.0	68.9	21.5	67.6	38.8
0.5	50.5	44.9	48.6	43.2	47.3	59.6
1.0	35.4	60.3	33.4	59.0	32.0	74.7
1.4	27.9	68.0	26.0	66.9	24.4	81.3
2.0	19.7	75.8	17.6	74.8	16.1	89.0
3.0	9.9	84.6	7.4	84.6	6.0	97.4
4.0	1.7	91.4	-0.8	91.2	-3.4	104.4
	$X_{Na^+} = 1/2$		$X_{Na^+} = 1/4$			
	run 4		run 5		run 6	
m	E_{Cl^-} (mV)	E_{K^+} (mV)	E_{Cl^-} (mV)	E_{K^+} (mV)	E_{Cl^-} (mV)	E_{K^+} (mV)
0.004	153.8	-56.2	162.3	-43.9	160.8	-40.1
0.008	134.2	-30.8	145.6	-26.2	144.7	-23.7
0.012	130.3	-30.7	135.4	-16.0	135.3	-14.4
0.016	123.8	-24.0	128.1	-8.3	128.4	-7.3
0.2	64.9	36.2	70.2	51.5	71.3	51.0
0.5	44.4	57.2	49.7	71.8	50.3	71.5
1.0	30.2	73.0	34.1	86.3	34.8	86.2
1.4	22.3	80.5	26.6	92.7	27.2	93.4
2.0	13.9	88.5	18.3	99.9	18.7	100.9
3.0	3.6	98.1	8.3	108.8	8.5	108.8
4.0	-4.7	103.9	-0.7	115.3	-0.3	114.4

The runs for $X_{Na^+} = 1$ and $X_{Na^+} = 0$ are already deposited in *Activity of Individual Ions in aqueous solutions, 2004*, and in *Activity of Individual Ions in aqueous solutions, 2005*.

System 3: NaBr + NaCl

Measured by: Eva Rodil

Explanation of Symbols:

m - molality of total electrolyte

E_{Na^+} - potential in mV for cation Na^+

- $X_{\text{Cl}^-} = m_{\text{Cl}^-} / (m_{\text{Cl}^-} + m_{\text{Br}^-})$

	$X_{\text{Cl}^-} = 1/2$			
	run 1	run 2		
m	E_{Na^+} (mV)	E_{Na^+} (mV)		
0.002	150.8	146.7		
0.004	166.4	164.3		
0.006	176.3	173.6		
0.009	183.1	181.1		
0.01	192.0	190.7		
0.03	214.0	213.8		
0.07	233.4	233.2		
0.1	241.8	241.6		
0.2	258.5	258.5		
0.4	276.2	276.0		
0.6	286.7	286.6		
0.8	294.5	294.4		
1.0	300.8	300.7		
1.2	306.2	306.0		
1.4	310.9	310.8		
1.6	315.1	315.0		
2.0	322.5	322.4		
2.5	330.4	330.3		
3.0	337.5	337.4		
4.0	350.0	349.7		

The runs of for $X_{\text{Cl}^-} = 1$ and $X_{\text{Cl}^-} = 0$ are already deposited in *Activity of Individual Ions in aqueous solutions, 2004*, and in *Activity of Individual Ions in aqueous solutions, 2005*.