

Potassium determination in samples

Potassium content determination in selected samples by direct measurement with potassium ISE electrodes.

<b>Sample</b>	Potassium sample solutions (50 mL) Potassium chloride, KCl, M = 74.55
<b>Compound</b>	Potassium, K M = 39.1, z = 1
<b>Chemicals</b>	ISA (ME-51340072) solution for Half Cell and (ME-51344762) perfectION sensors Reference electrolyte for DX200 (ME-51340045) Electrolyte for perfectION (ME-51344754) Electrolyte for Half Cell (ME-51340033)
<b>Titrant</b>	-
<b>Standard</b>	-
<b>Indication</b>	DX239-K ISE + DX200 Ref. Electrode, and perfectION™ Combination K ISE
<b>Chemistry</b>	-
<b>Calculation</b>	R1 = E (ppm)  R2 = R1 * f (ppm)  f = Dilution factor
<b>Waste disposal</b>	-
<b>Author, Version</b>	Sohel Ansari, IMSG AnaChem, Version 2.0 Revised: C. De Caro, MSG AnaChem

<b>Preparation and Procedures</b>
<b>CAUTION</b>
<ul style="list-style-type: none"> <li>- Use safety goggles, a lab coat and wear gloves. If possible, work in a fume hood.</li> <li>- Ensure accurate cleaning of sensor is sufficient after each titration.</li> </ul>
Sample handling
<ul style="list-style-type: none"> <li>- The K ISE electrode is previously adjusted (calibrated) using potassium chloride standard solutions (see application M110)</li> <li>- The required amount of sample is taken into the titration beaker. Details of sample preparation are given under comments section.</li> <li>- 1 mL ISA solutions are added with a pipette to each beaker.</li> <li>- Connect the first beaker to the titration stand and start the method.</li> <li>- After measurement of each solution the electrodes are cleaned with deionized water before starting the next sample.</li> </ul>
<b>Remarks</b>
<ul style="list-style-type: none"> <li>- To improve accuracy and reproducibility of the measurement, perform the electrode calibration and sample measurement at the same temperature and stirring speed.</li> <li>- The titrator corrects the slope of the sensor according to the Nernst equation by manual entry or temperature measurement with a temperature sensor.</li> <li>- Rinse electrode with deionized water after each measurement and remove adhering water drops with a soft paper tissue.</li> <li>- For the sample which has concentration below 1 ppm of potassium discard atleast first three sample measurement.</li> </ul>

<b>Instruments</b>	<ul style="list-style-type: none"> <li>- Titration Excellence T50/T70/T90 (Other Titrators: depending on instrument type, manual operation and method changes are necessary)</li> <li>- Seven Excellence Ion meter</li> </ul>
<b>Accessories</b>	<ul style="list-style-type: none"> <li>- PP Titration beakers (ME-51109388)</li> <li>- Rainin pipette</li> <li>- DT1000 Temperature sensor (ME-51109828)</li> </ul>

## Results

Instruments	Samples	Label Claim (ppm)	Perfection K ISE		DX239 K ISE	
			Mean Result of 6 Samples (ppm)	RSD (%)	Mean Result of 6 Samples (ppm)	RSD (%)
<b>T90/T70/T50</b>	Apple Juice	- NA -	73.601	0.068	72.126	0.118
	Grape Juice	- NA -	103.701	0.292	104.239	0.459
	Orange Juice	- NA -	149.734	0.237	150.504	0.285
	Milk	- NA -	553.209	0.465	552.235	0.398
	Liquid Fertilizer	- NA -	545.619	0.049	542.448	0.233
	Wine	- NA -	100.409	0.271	102.708	0.698
	Waste Water	- NA -	30.043	0.719	30.204	0.432
	Salt Producer	-NA-	2408.428	0.652	2228.003	0.415
	Infusion Solution	- NA -	1.476	0.583	1.576	0.598
	Soil	- NA -	17.668	0.061	17.372	0.697
<b>Seven Excellence pH meter</b>	Apple Juice	- NA -	73.667	0.317	74.267	0.731
	Grape Juice	- NA -	104.550	0.289	104.867	0.375
	Orange Juice	- NA -	151.467	0.170	147.817	0.545
	Milk	- NA -	551.767	0.161	549.900	0.504
	Liquid Fertilizer	- NA -	546.383	0.300	546.517	0.173
	Wine	- NA -	100.283	0.482	99.917	0.249
	Waste Water	- NA -	29.633	0.174	30.033	0.749
	Salt Producer	- NA -	2375.365	0.494	2430.023	0.544
	Infusion Solution	- NA -	1.500	0.000	1.500	0.000
	Soil	-NA-	14.920	0.144	16.609	0.121

## Results

No.	Salt Producer Sample Weight	Perfection K ISE	Salt Producer Sample Weight	DX239 K ISE
1	1.0103 g	R1= 48.754 ppm R2= 2412.848 ppm	1.0563 g	R1= 47.078 ppm R2= 2228.439 ppm
2	1.0231 g	R1= 48.899 ppm R2= 2389.747 ppm	1.0680 g	R1= 47.383 ppm R2= 2218.305 ppm
3	1.0099 g	R1= 48.840 ppm R2= 2418.061 ppm	1.0625 g	R1= 47.185 ppm R2= 2220.471 ppm
4	1.0152 g	R1= 48.857 ppm R2= 2406.275 ppm	1.0469 g	R1= 46.995 ppm R2= 2244.484 ppm
5	1.0198 g	R1= 48.798 ppm R2= 2392.528 ppm	1.0601 g	R1= 47.210 ppm R2= 2226.677 ppm
6	1.0088 g	R1= 49.050 ppm R2= 2431.106 ppm	1.0599 g	R1= 47.264 ppm R2= 2229.644 ppm
	Mean	R1= 48.866 ppm R2= 2408.428 ppm	Mean	R1= 47.186 ppm R2= 2228.003 ppm
	Rel. standard deviation	0.210 % 0.652 %	Rel. standard deviation	0.290 % 0.415 %

Automation is not used for ISE measurement due to clinging water drops on the electrode and stirrer after rinsing. This leads to erroneous results by lowering the sample concentration.

## Comments

Sample	Preparation
Apple Juice	Take 50 mL of Apple Juice into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Grape Juice	Take 50 mL of Grape Juice into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Orange Juice	Take 50 mL of Orange Juice into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Milk	Take 50 mL of Milk into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Liquid Fertilizer	Take 50 mL of Liquid Fertilizer into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Wine	Take 50 mL of Wine into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Waste Water	Take 50 mL of filtered Waste water into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Salt Producer	Carefully weigh 1 gram of Salt into a clean titration beaker add 50 mL of deionized water and 1.0 mL of ISA solution, stir the solution to dissolve and measure.
Infusion Solution	Take 50 mL of Infusion solution into a clean titration beaker add 1.0 mL of ISA solution stir the solution to mix for few minutes and measure.
Soil	Carefully weigh 3 grams of Soil into a clean titration beaker add 50 mL of deionized water and 1.0 mL of ISA solution, stir the solution to homogenize and measure.

### Remarks:

The calibration and potassium concentration determination of each sample is automatically performed in a method. Between the calibration and measurement, the electrode is conditioned for 5 minutes in deionized water to prevent contamination with potassium ions.

## Method

<b>001 Title</b>	Type	General titration
	Compatible with	T50 / T70 / T90
	ID	M1_K_SPL_08
	Title	—
	...	
<b>002 Sample</b>	Number of IDs	1
	ID 1	Sample
	Entry type	Weight
	Lower limit	0.0 g
	Upper limit	10.0 g
	Density	1.0 g/mL
	Correction factor	1.0
	Temperature	25.0 °C
	Entry	Arbitrary
<b>003 Titration stand (Manual stand)</b>	Type	Manual stand
	Titration stand	Manual stand 1
<b>004 Stir</b>	Speed	60 %
	Duration	10 s
	Condition	No
<b>005 Stir</b>	Speed	30 %
	Duration	10 s
	Condition	No
<b>006 Measure (normal) [1]</b>		
	<b>Sensor</b>	
	Type	ISE
	Sensor	DX239-K*
	Unit	ppm
	Ion charge	1
	<b>Temperature acquisition</b>	
	Temperature acquisition	Yes
	Temperature sensor	DT1000
	Temperature unit	°C
	<b>Stir</b>	
	Speed	30 %
	<b>Acquisition of measured values</b>	
	Acquisition	Equilibrium controlled
	dE	0.5 mV
	dt	1 s
	t (min)	3 s
	t (max)	30 s
	Mean value	No
	<b>Condition</b>	
	Condition	No
<b>007 Calculation R1</b>		
	Result	Content
	Result unit	ppm
	Formula	R1=E
	Constant	C=1
	M	M[None]
	z	z[None]
	Decimal places	4
	Result limits	No
	Extra statistical func.	No
	Send to buffer	No
	Condition	No
<b>008 Calculation R2</b>		
	Result	Content
	Result unit	ppm
	Formula	R2=R1 *f
	Constant	C=1
	M	M[None]
	z	z[None]
	Decimal places	3
	Result limits	No
	Extra statistical func.	No
	Send to buffer	No
	Condition	No
<b>009 End of sample</b>		
<b>010 Record</b>		
	<b>Report</b>	
	Report template	Titration report_01
	Print	No
	Condition	No

<b>001 Title</b>	Type	General titration
	Compatible with	T50 / T70 / T90
	ID	MO_K_SPL_07
	Title	—
	...	
<b>002 Sample</b>	Number of IDs	1
	ID 1	Sample
	Entry type	Weight
	Lower limit	0.0 g
	Upper limit	10.0 g
	Density	1.0 g/mL
	Correction factor	1.0
	Temperature	25.0 °C
	Entry	Arbitrary
<b>003 Titration stand (Manual stand)</b>	Type	Manual stand
	Titration stand	Manual stand 1
<b>004 Stir</b>	Speed	30 %
	Duration	180 s
	Condition	No
<b>005 Measure (normal) [1]</b>		
	<b>Sensor</b>	
	Type	ISE
	Sensor	PerfectION-K*
	Unit	ppm
	Ion charge	1
	<b>Temperature acquisition</b>	
	Temperature acquisition	Yes
	Temperature sensor	DT1000
	Temperature unit	°C
	<b>Stir</b>	
	Speed	30 %
	<b>Acquisition of measured values</b>	
	Acquisition	Equilibrium controlled
	dE	0.5 mV
	dt	1 s
	t (min)	3 s
	t (max)	30 s
	Mean value	No
	<b>Condition</b>	
	Condition	No
<b>006 Calculation R1</b>		
	Result	Content
	Result unit	ppm
	Formula	R1=E
	Constant	C=1
	M	M[None]
	z	z[None]
	Decimal places	4
	Result limits	No
	Extra statistical func.	No
	Send to buffer	No
	Condition	No
<b>007 Calculation R2</b>		
	Result	Content
	Result unit	ppm
	Formula	R2=R1 *f
	Constant	C=1
	M	M[None]
	z	z[None]
	Decimal places	3
	Result limits	No
	Extra statistical func.	No
	Send to buffer	No
	Condition	No
<b>008 End of sample</b>		
<b>009 Record</b>		
	<b>Report</b>	
	Report template	Titration report_01
	Print	No
	Condition	No