

Determination of Potassium Sorbate (E 202) in Food Products

Potassium sorbate (E 202) in margarine and cheese spread is determined by titration with perchloric acid in a non-aqueous solution.

Sample	Margarine, 10 g Cheese spread, 0.7 g Potassium sorbate, 0.1 g
Compound	Potassium sorbate, C ₆ H ₇ KO ₂ M = 150.22 g/mol z = 1
Chemicals	Glacial acetic acid, CH ₃ COOH 40 mL
Titratant	Perchloric acid, HClO ₄ in glacial acetic acid c(HClO ₄) = 0.1 mol/L
Standard	Tris (hydroxymethyl)-aminomethane (THAM) M = 121.14 g/mol, z = 1
Indication	DGi113-SC Combined pH glass electrode
Chemistry	HClO ₄ + C ₆ H ₇ KO ₂ → C ₆ H ₈ O ₂ + KClO ₄
Calculation	<u>Margarine (ppm):</u> R1 = Q*C/m C = M*1000/z <u>Cheese spread/C₆H₇KO₂-Std. (%):</u> R1 = Q*C/m C = M/(10*z) Q = HClO ₄ consumption in mmol M = Molar mass of C ₆ H ₇ KO ₂ z = 1
Waste disposal	Final disposal as halogenated, organic waste after neutralization
Author, Version	Sohel R. Ansari / Robin Isyas IMSG Anachem, Sept 2011 Revised: Sept 2011 C. De Caro, MSG AnaChem

Preparation and Procedures
<u>Precautions:</u>
<ul style="list-style-type: none"> - The pH electrode is dipped overnight in deionized water in order to condition it. This guarantees the rehydration of the sensor. - Use safety goggles, mask and wear gloves while handling acids. - Ensure the cleaning of electrode is sufficient after each titration.
<u>Sample titration of potassium sorbate:</u>
<ul style="list-style-type: none"> - Weigh 0.1 g of potassium sorbate, add 40mL of glacial acetic acid, dissolve and titrate.
<u>Sample titration of margarine:</u>
<ul style="list-style-type: none"> - Weigh about 10.0 g margarine, add 40 mL glacial acetic acid, dissolve and titrate.
<u>Sample titration of cheese spread:</u>
<ul style="list-style-type: none"> - Weigh about 0.7 g cheese spread, add 40 mL glacial acetic acid, dissolve and titrate.
Remarks
<ul style="list-style-type: none"> • A thermostatable beaker is used to improve dissolution of the highly viscous samples. • By increasing the stir time the dissolution can be also improved. • The sample solution is warmed at approximately 40.0 °C to dissolve and to avoid that samples are sticking on the electrode and the propeller. Thus, a better reproducibility is achieved • Titer determination: The titer value TITER = 1.00291 was determined according to M524. See METTER TOLEDO Application M524, "Titer of HClO₄ 0.1 mol/L (non aqueous)", Titration Applications Brochure No. 18, ME-51 724 917 (Dec. 2005). • Potassium sorbate is mainly used as a food preservative (E 202) to inhibit molds and yeasts in e.g. cheese, baked goods, dried meats, yogurt, wine, soft and fruit drinks. E202 can also be found in many dried fruit products.

Instruments

- G20 Compact Titrator
Note: The titration can be also performed with the Titration Excellence T50/T70/T90
- XP205 Balance
- Thermostatable beaker (ME-00023517)

Accessories

- LabX light titration software
- DV1010 Burette 10 mL (ME-51107501)
- Water circulator bath

Results (Potassium sorbate)**All results**

Method-ID	Standard	Potassium sorbate
Content	Potassium sorbate	(1/6)
	R1 (%)	100.416
Content	Potassium sorbate	(2/6)
	R1 (%)	100.005
Content	Potassium sorbate	(3/6)
	R1 (%)	99.917
Content	Potassium sorbate	(4/6)
	R1 (%)	99.874
Content	Potassium sorbate	(5/6)
	R1 (%)	99.746
Content	Potassium sorbate	(6/6)
	R1 (%)	99.817

Statistics

Method-ID	Potassium sorbate
R1	
Samples	6
Mean	99.962 %
s	0.239 %

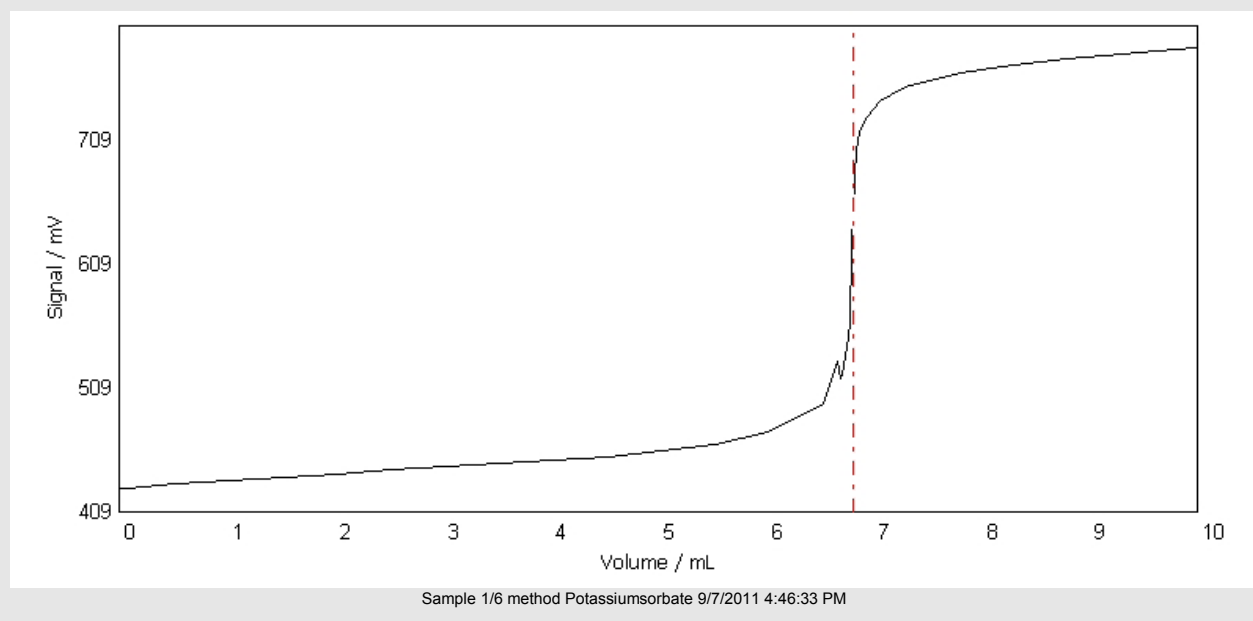
Titration curve (Potassium sorbate)

Table of measured values (Potassium sorbate)

	Volume mL	Increment mL	Signal mV	Change mV	1st deriv. mV/mL	Time s	Temperature °C
	0.0000	NaN	428.1	NaN	NaN	0	25.0
	0.0200	0.0200	428.2	0.1	NaN	2	25.0
	0.0400	0.0200	428.4	0.2	NaN	4	25.0
	0.0900	0.0500	428.6	0.2	NaN	7	25.0
	0.2150	0.1250	429.3	0.7	NaN	9	25.0
	0.5275	0.3125	431.2	1.9	5.76	12	25.0
	1.0275	0.5000	434.0	2.8	5.94	16	25.0
	1.5275	0.5000	436.9	2.9	5.91	20	25.0
	2.0275	0.5000	440.0	3.1	5.69	24	25.0
	2.5275	0.5000	442.9	2.9	5.35	28	25.0
	3.0275	0.5000	445.6	2.7	5.09	32	25.0
	3.5275	0.5000	448.1	2.5	4.89	36	25.0
	4.0275	0.5000	450.7	2.6	4.26	40	25.0
	4.5275	0.5000	453.7	3.0	4.15	44	25.0
	5.0275	0.5000	457.9	4.2	10.38	49	25.0
	5.5275	0.5000	463.8	5.9	21.99	55	25.0
	6.0275	0.5000	473.3	9.5	46.83	63	25.0
	6.5275	0.5000	496.2	22.9	114.88	70	25.0
	6.6650	0.1375	530.9	34.7	243.02	73	25.0
	6.6850	0.0200	516.7	-14.2	468.74	78	25.0
	6.7050	0.0200	520.4	3.7	745.69	80	25.0
	6.7550	0.0500	541.7	21.3	997.27	86	25.0
	6.7750	0.0200	561.4	19.7	1151.12	91	25.0
	6.7950	0.0200	623.4	62.0	1193.67	103	25.0
EQP1	6.803200	NaN	646.9	NaN	1219.34	NaN	NaN
	6.8150	0.0200	680.7	57.3	909.9	115	25.0
	6.8350	0.0200	700.6	19.9	921.74	122	25.0
	6.8700	0.0350	715.5	14.9	614.02	126	25.0
	6.9355	0.0655	728.8	13.3	341.21	129	25.0
	7.0600	0.1245	741.5	12.7	158.29	132	25.0
	7.2945	0.2345	752.2	10.7	69.64	135	25.0
	7.7945	0.5000	763.4	11.2	24.66	138	25.0
	8.2945	0.5000	770.3	6.9	NaN	142	25.0
	8.7945	0.5000	775.6	5.3	NaN	145	25.0
	9.2945	0.5000	779.6	4.0	NaN	149	25.0
	9.7945	0.5000	783.2	3.6	NaN	152	25.0
	10.0000	0.2055	784.1	0.9	NaN	154	25.0

Sample 1/6 method Potassiumsorbate 9/7/2011 4:46:33 PM

Comments (Potassium sorbate)

- In this case, pure potassium sorbate is used to test the titration method.
- The result indicates the recovery rate of the substance.

Results (Margarine)

All results

Method-ID	Sample	pot	sor
Content	Margarine		(1/9)
	R1 (ppm)	5319.712	
Content	Margarine		(2/9)
	R1 (ppm)	5575.516	
Content	Margarine		(3/9)
	R1 (ppm)	5436.623	
Content	Margarine		(4/9)
	R1 (ppm)	5662.005	
Content	Margarine		(5/9)
	R1 (ppm)	5365.273	
Content	Margarine		(6/9)
	R1 (ppm)	5491.745	
Content	Margarine		(7/9)
	R1 (ppm)	5632.622	
Content	Margarine		(8/9)
	R1 (ppm)	5506.801	
Content	Margarine		(9/9)
	R1 (ppm)	5342.315	

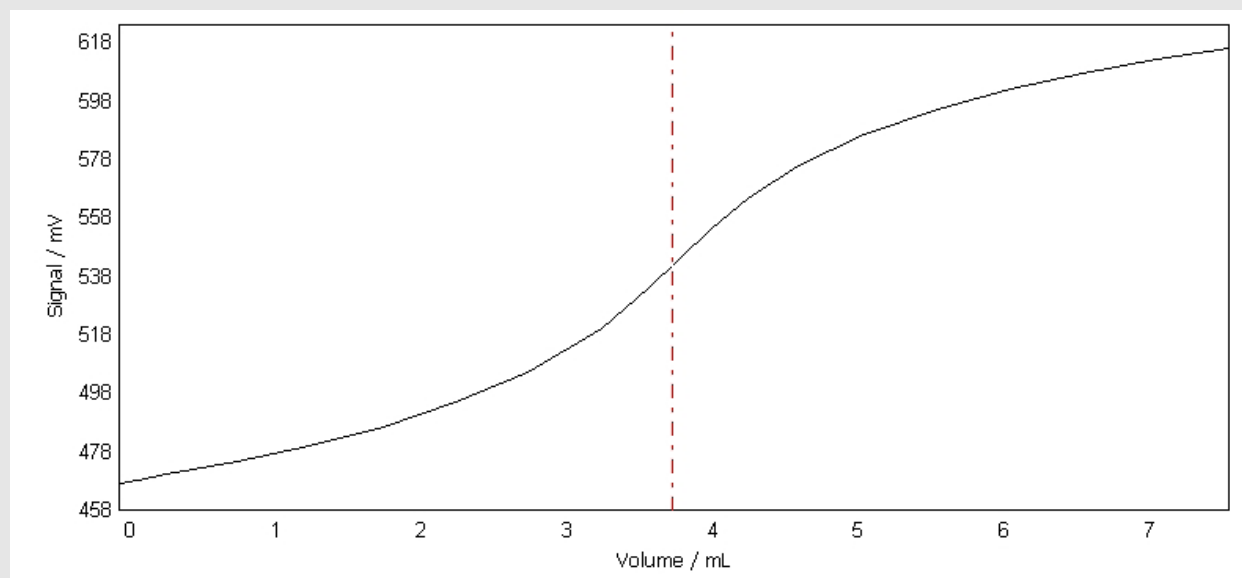
Statistics

Method-ID	Sample	pot	sor
R1			
Samples	9		
Mean	5481.401	ppm	
s	125.536	ppm	
srel	2.290	%	

Additional results

Margarine	n	Content (ppm)	s (ppm)	srel (%)	Comments
	9	6301.606	127.216	2.019	10 min longer in water bath before titration
	9	6371.828	106.070	1.665	10 min longer in water bath before titration

Titration curve (Margarine)



Sample 1/9 method samplepot sor 9/9/2011 10:07:48

Table of measured values (Margarine)

	Volume mL	Increment mL	Signal mV	Change mV	1st deriv. mV/mL	Time s	Temperature °C
EQP1	0.0000	NaN	466.8	NaN	NaN	0	25.0
	0.0050	0.0050	467.0	0.2	NaN	3	25.0
	0.0100	0.0050	467.1	0.1	NaN	6	25.0
	0.0225	0.0125	467.3	0.2	NaN	9	25.0
	0.0535	0.0310	467.7	0.4	NaN	12	25.0
	0.1310	0.0775	468.3	0.6	9.53	15	25.0
	0.3250	0.1940	470.1	1.8	9.41	18	25.0
	0.8100	0.4850	474.7	4.6	9.71	21	25.0
	1.3100	0.5000	480.2	5.5	10.76	24	25.0
	1.8100	0.5000	486.6	6.4	13.71	27	25.0
	2.3100	0.5000	494.7	8.1	18.92	31	25.0
	2.8100	0.5000	505.3	10.6	26.22	34	25.0
	3.3100	0.5000	520.1	14.8	33.86	38	25.0
	3.6370	0.3270	533.9	13.8	38.30	41	25.0
	3.802629	NaN	541.6	NaN	40.99	NaN	NaN
	3.8365	0.1995	543.2	9.3	40.97	44	25.0
	4.0730	0.2365	554.5	11.3	39.43	47	25.0
	4.3170	0.2440	564.3	9.8	34.85	50	25.0
	4.6665	0.3495	575.8	11.5	28.80	53	25.0
	5.1195	0.4530	586.6	10.8	21.59	56	25.0
5.6195	0.5000	595.3	8.7	NaN	59	25.0	
6.1195	0.5000	602.2	6.9	NaN	62	25.0	
6.6195	0.5000	607.4	5.2	NaN	66	25.0	
7.1195	0.5000	612.0	4.6	NaN	68	25.0	
7.6195	0.5000	616.1	4.1	NaN	72	25.0	

Sample 1/9 method samplepotsor 9/9/2011 10:07:48

Comments (Margarine)

- Care has to be taken that margarine is completely dissolved into the solvent. This is achieved by stirring during a long time, and also by warming up the solution to improve the dissolution.
- Since a relatively large sample size is introduced into the titration cell i.e. approx. 10 g, it is necessary to avoid any rest sticking onto e.g. the electrode or the propeller stirrer. In this way, accuracy and reproducibility will be improved.

Results (Cheese spread)

All results

Method-ID	Samplepotsor	
Content	Cheese spread	(1/9)
	R1 (%)	6.887
Content	Cheese spread	(2/9)
	R1 (%)	6.901
Content	Cheese spread	(3/9)
	R1 (%)	7.032
Content	Cheese spread	(4/9)
	R1 (%)	6.965
Content	Cheese spread	(5/9)
	R1 (%)	7.039
Content	Cheese spread	(6/9)
	R1 (%)	7.020
Content	Cheese spread	(7/9)
	R1 (%)	7.009
Content	Cheese spread	(8/9)
	R1 (%)	7.143
Content	Cheese spread	(9/9)
	R1 (%)	7.031

Statistics

Method-ID	Samplepotsor	
R1		
Samples	9	
Mean	7.003	%
s	0.078	%
srel	1.108	%

Titration curve (Cheese spread)

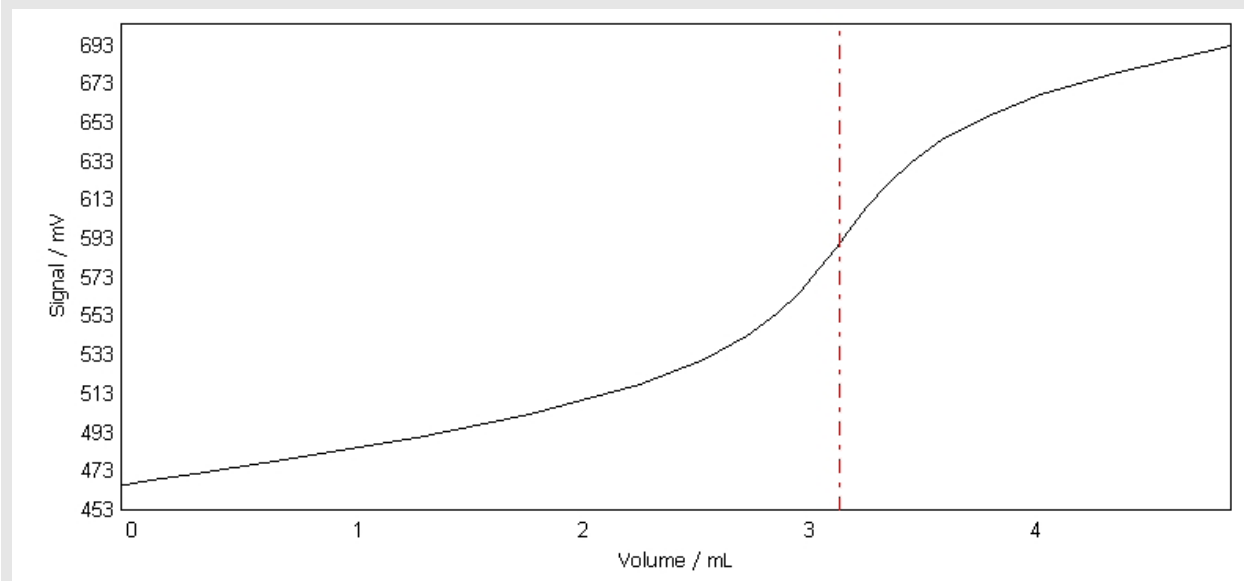


Table of measured values (Cheese spread)

	Volume mL	Increment mL	Signal mV	Change mV	1st deriv. mV/mL	Time s	Temperature °C
	0.0000	NaN	465.4	NaN	NaN	0	25.0
	0.0050	0.0050	465.7	0.3	NaN	3	25.0
	0.0100	0.0050	465.8	0.1	NaN	6	25.0
	0.0225	0.0125	466.2	0.4	NaN	9	25.0
	0.0535	0.0310	466.8	0.6	NaN	12	25.0
	0.1310	0.0775	468.2	1.4	18.66	15	25.0
	0.3250	0.1940	471.6	3.4	18.23	18	25.0
	0.8100	0.4850	480.4	8.8	17.21	22	25.0
	1.3100	0.5000	490.4	10.0	19.11	25	25.0
	1.8100	0.5000	502.6	12.2	27.47	29	25.0
	2.2935	0.4835	518.0	15.4	46.15	33	25.0
	2.5805	0.2870	531.0	13.0	65.48	37	25.0
	2.7675	0.1870	542.9	11.9	84.07	40	25.0
	2.9030	0.1355	554.4	11.5	101.05	44	25.0
	3.0085	0.1055	565.9	11.5	113.75	48	25.0
	3.0935	0.0850	577.4	11.5	127.50	52	25.0
	3.1650	0.0715	588.3	10.9	142.70	57	25.0
EQP1	3.183257	NaN	591.2	NaN	142.79	NaN	25.0
	3.2355	0.0705	599.4	11.1	142.23	63	25.0
	3.3090	0.0735	610.2	10.8	127.29	68	25.0
	3.3960	0.0870	621.4	11.2	113.11	74	25.0
	3.5030	0.1070	633.1	11.7	98.60	80	25.0
	3.6325	0.1295	644.0	10.9	NaN	86	25.0
	3.8185	0.1860	655.7	11.7	NaN	92	25.0
	4.0725	0.2540	667.6	11.9	NaN	98	25.0
	4.4140	0.3415	678.9	11.3	NaN	105	25.0
	4.9140	0.5000	692.8	13.9	NaN	109	25.0

Sample 1/9 method samplepotsor 9/9/2011 3:31:04 PM

Comments (Cheese spread)

- Care has to be taken that cheese spread is completely dissolved into the solvent. This is achieved by stirring during a long time, and also by warming up the solution to improve the dissolution.
- It is necessary to avoid any rest sticking onto e.g. the electrode or the propeller stirrer. In this way, accuracy and reproducibility will be improved.

Method

001 Title

Type	General titration
Compatible with	G20
ID	m485G20
Title	Potassium sorbate
Author	LabX-Light
Date/Time	07.09.2011 17:35:34
Modified at	14.09.2011 12:55:30
Modified by	LabX-Light
Protect	No
SOP	None

002 Sample

Number of IDs	1
ID 1	Margarine (Potassium sorbate)
Entry type	Weight
Lower limit	0.0 g
Upper limit	25.0 g (0.1 g)
Density	1.0 g/mL
Correction factor	1.0
Temperature	25.0°C
Entry	Before

003 Titration stand (Manual stand)

Type	Manual stand
Titration stand	Manual stand 1

004 Stir

Speed	30%
Duration	180 s
Condition	No

005 Titration (EQP) [1]

Titrant

Titrant	HClO ₄
Concentration	0.1 mol/L

Sensor

Type	pH
Sensor	DG113-SC
Unit	mV

Temperature acquisition

Temperature acquisition	No
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Stir

Speed	30%
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Predispense

Mode	None
Wait time	0 s

Control

Control	Normal (User)
Mode	Acid/base
Show parameters	Yes
Titrant addition	Dynamic
dE (set value)	12.0 mV
dV (min)	0.005 mL (0.02 mL)
dV (max)	0.5 mL
Mode	Equilibrium controlled
dE	0.5 mV (1.0 mV)
dt	1.0 s (2.0 mV)
t (min)	3 s (2 s)
t (max)	30 s (15 s)

Evaluation and recognition

Procedure	Standard
Threshold	10 (100 mV/mL)
Tendency	Positive
Ranges	0
Add. EQP criteria	None

Termination

At Vmax	10 mL
At potential	No
At slope	No
After number of recognized EQPs	1 (No)
Combined termination criteria	No

006 Calculation R1

Result type	Predefined
Calculation type	Direct titration
Result	Content
Result unit	ppm (%)
Formula	$R1=Q*C/m$
Selected EQP	1
Constant	$C=M*1000/z (M/(10*z))$
M	M[Potassium sorbate]
z	z[Potassium sorbate]
Decimal places	3
Result limits	No
Record statistics	Yes

007 Record

Summary	No
Results	Per sample
Raw results	Per sample
Table of meas. values	Last titration function
Sample data	No
Resource data	No
E - V	Last titration function
dE/dV - V	No
log dE/dV - V	No
d ² E/dV ² - V	No
BETA - V	No
E - t	No
V - t	No
dV/dt - t	No
T - t	No
E - V & dE/dV - V	No
V - t & dV/dt - t	No
Method	No
Series data	No

008 End of sample