Quantitative analysis of hydrogen peroxide

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Use

The concentration of hydrogen peroxide in a solution is determined by redox titration with potassium permanganate.

Appliances

Titrator:	TitroLine 6000/7000/7750
Burette:	WA 20

Electrodes

Electrode :	Pt 62, Pt 6280 or Pt 62 RG
Electrolyte :	KCl (3 mol/L)

Reagents

Titration agent:	potassium permanganate $(KMnO_4)$ 0,02mol/L (0.1 N)
Standardization:	with ferrous sulphate (Fe(II))
other reagents:	sulfuric acid (H_2SO_4) ca. 25%

Description

Preparation of the sample

The sample is weighed in accurately with four decimal places into a 100 mL beaker and filled up to 60 mL with distilled water. After that 5 mL of a sulfuric acid (25%) are added.

Titration

Hydrogen peroxide is determined by titration with potassium permanganate. The reaction runs in an acid solution and is based on the following chemical equation:

chemical equation: $2\,MnO_4^- + 5\,H_2O_2 + 6\,H^+ \rightarrow 2\,Mn^{2+} + 5\,O_2\uparrow + 8\,H_2O$

The chemical equation shows that the ratio of permanganate and hydrogen peroxide is 2:5, what is allowed for the calculation below.

calculation:

$$H_2O_2[\%] = \frac{5 \cdot c(KMnO_4) \cdot V(KMnO_4) \cdot t(KMnO_4) \cdot M(H_2O_2) \cdot 100}{2 \cdot m(H_2O_2) \cdot 1000}$$

$c(KMnO_4)$: concentration of the measure solution [mol/L] (here: 0,02 mol/L)
$V(KMnO_4)$: value of the measure solution [mL]
$t(KMnO_4)$: titre of the measure solution
$M(H_2O_2)$: molar mass of H_2O_2 (34,0146 g/mol)
$m(H_2O_2)$: amount of the sample

That means that 1 ml 0.02 mol/l $KMnO_4$ = 1,701 mg H_2O_2

Please take the titration parameter out of the suitable method. To get proper results you have to make a titre for the potassium permanganate with ferrous sulfate.

Method

Method data

Method name:	H2O2	Created at:	02/28/13 15:52:24
Method type:	Automatic titration	Last modification:	03/05/13 17:29:46
Measured value:	mV	Damping settings:	None
Titration mode:	Dynamic	Documentation:	GLP
Dynamic:	Average		
Measuring speed / drift:	User-defined:	minimum holding time:	05 s
		maximum holding time:	12 s
		Measuring time:	03 s
		Drift:	50 mV/min
Initial waiting time:	0 s		
Titration direction:	Increase		
Pretitration:	1.000 ml	Delay time:	20 s
End value:	Off		
EQ:	On (1)		
Slope value:	Steep	Value:	700

Dosing parameter

Dosing speed:	15.00 %	Filling speed:	30 s
Maximum dosing volume:	50.00 ml		

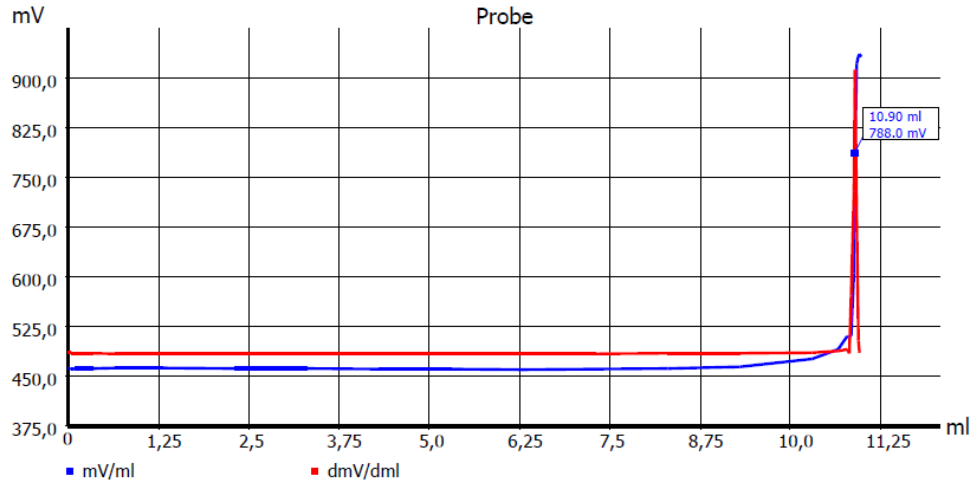
Calculation formula

H2O2:	(EQ1-B)*T*M*F1/(W*F2)	Mol (M):	1.70100
Unit:	%	Decimal places:	2
m-value:	EQ2*T*M*F1/(W*F2)	Mol (M):	1.00000
Unit:	mmol/l	Decimal places:	2
Blank value (B):	0.0000 ml	Titre (T):	1.00000000
Factor 1 (F1):	0.1000	Weight (W):	man
Factor 2 (F2):	1.0000	Statistics:	Off

Example

sample titration:

Titrationsdiagramm



Methodendaten

Methodenname:	H2O2 mit KMnO4	Titrationsdauer:	3 m 28 s
Enddatum:	17.07.12	Endzeit:	16:42:11

Titrationsdaten

Proben ID:	ohne	Einwaage:	1.0000 g
Start mV:	462.8 mV	End mV:	932.2 mV
EQ:	10.899 ml / 788.0 mV	result:	10.90 ml

Hints

If you have any questions concerning the application, you are welcome to contact us.

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