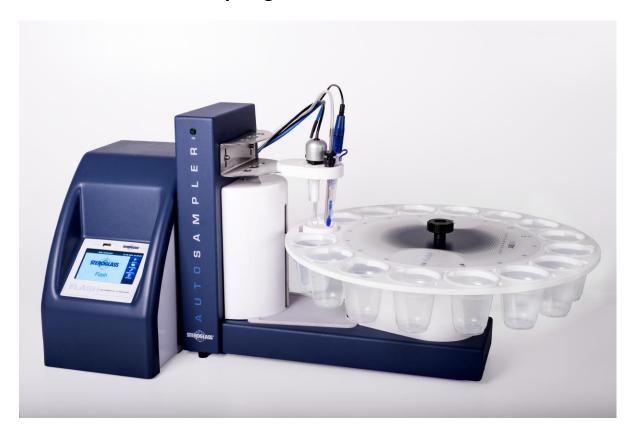


FLASH TITRATOR Hydrogen Peroxide Titer



PRINCIPLE

Hydrogen peroxide is commercially available in the form of an aqueous solution. The concentration of hydrogen peroxide is described in terms of "volumes," which indicate the number of liters of oxygen that can be developed under normal conditions from one liter of H_2O_2 solution, according to the reaction:

$$2H_2O_2 \rightarrow 2H_2O + O_{2(g)}$$

For example, one liter of 5-volume H_2O_2 solution can develop 5 liters of oxygen, and corresponds to a concentration of 1.46% by weight.

The indication of the "volumes" of a certain dilution of hydrogen peroxide is different from the concentration in percentage, and the use of these two different measurement methods sometimes causes errors. Chemical analysis laboratories generally indicate the percentage concentration of hydrogen peroxide, while manufacturers of products for domestic use indicate "volumes." The list below compares the two measurement systems:

- Hydrogen peroxide 3% corresponds to 10 volumes
- Hydrogen peroxide 3.6% corresponds to 12 volumes
- Hydrogen peroxide 10% corresponds to 34 volumes
- Hydrogen peroxide 30% corresponds to 111 volumes



The titer of hydrogen peroxide is determined using potassium permanganate in an acid medium.

Permanganatometry is a redox titration that uses potassium permanganate as a reagent.

KMnO₄ is widely used in analysis for its strong oxidizing power, for the strong color of its oxidized form, and for the fairly low cost of the commercial product.

Hydrogen peroxide reacts with the potassium permanganate according to the reaction:

 $5H_2O_2 + 2 KMnO_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 5O_2$

INSTRUMENT AND ACCESSORIES

- Flash Titrator with at least one burette and one peristaltic pump;
- Single-position stand or AS24 Automatic Sampler;
- Combined redox electrode with Pt ring;

REAGENTS

- Titrating solution: Potassium Permanganate KMnO₄ 0.02M
- Sulfuric Acid 25% w/v (to be dosed by peristaltic pump) (To prepare 1 liter of solution, start from 250 grams or 140 ml of concentrated H₂SO₄ and bring to volume with distilled H2O.)

NOTES:

To prepare 250 ml of 0.02 M solution of Potassium Permanganate KMnO4 (158.03 g/mol) weigh exactly 0.7902 g of permanganate powder and bring to volume with distilled water in a 250 ml flask. It is advisable to prepare only the quantity of titrant necessary, given that the permanganate solution quickly loses its titer.

SAMPLE PREPARATION

If the sample is in liquid form, such as commercially-available hydrogen peroxide, it is possible to work with the sample as is, by weight or by volume.

If instead the sample consists of a cream or a very viscous product, it should be diluted.

For example, if you need to determine the titer of an oxidizing cream, weigh about 2-3 grams of cream, write down the exact weight and bring to volume with distilled water in a 1 liter flask.

Take 25 ml and titrate it directly with the Flash, entering the exact weight of the sample.

The machine factor 8.5 in this case must be multiplied by the dilution factor 40 to obtain the exact concentration percentage.

Because we are working by weight, the SAMPLE VOLUME in the method is set to 0; thus the Flash will ask you to enter the weight of the sample before starting the analysis.

PRELIMINARY OPERATIONS

- 1) Go to METHODS from the main menu and select the H₂O₂ TITRATION method;
- 2) If connected to the autosampler, enter the number of samples present, e.g. "3", and place the beakers in the sampler;
- 3) If you want to give a name to the samples, enter the name in SAMPLE DESCRIPTION and enter the weight in grams of each sample;
- 4) Press START to start the analysis.



Method Name TITER H202 WEIGHT	Mothod Typo	Inflection
Descript./Sample no. Sample Degassing sec: 0 Pump A N: 1 Pump A sec: 10 Pump B N: 0 Pump B sec: 0 Pump C N: 0 Pump C Sec: 0 Stirrer speed 8 Pre-stirring time 5 Measurement type mv Initial auto-stability (mv) 5 Initial addition 0.8 (minimum 0.5) Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 15.0 Polarization value NA Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 2 Max. stability time (s) 15.0 Polarization value NA Auto-stability time (s) 2 Max. stability time (s) 10.00 Sample volume (ml) 0.00 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	Method Type	-
Descript./Sample no. Degassing sec: Pump A N: Pump A Sec: Pump B N: Pump B sec: O Pump C N: O Pump C Sec: O Stirrer speed Bre-stirring time Initial auto-stability (mv) Initial stirring Fitrant burette Addition (ml) Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability (mv) S Auto-stability time (s) Auto-stability (mv) S Auto-stability (mv) S Auto-stability (mv) D S Auto-stability (mv) S Auto-stability (mv) S Auto-stability time (s) Auto-stability time (s) S Seagent standardization Washing type Washing position Washing type Washing position VDEFAULT Titration direction Increasing	Method Name	====
Degassing sec: 0 Pump A N: 1 Pump A sec: 10 Pump B N: 0 Pump B sec: 0 Pump C N: 0 Pump C Sec: 0 Stirrer speed 8 Pre-stirring time 5 Measurement type mv Initial auto-stability (mv) 5 Initial auto-stability time (s) 2 Initial addition 0.8 (minimum 0.5) Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 15.0 Polarization value NA Auto-stability time (s) 2 Max. stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/I) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing type DEFAULT Titration direction Increasing	Descript /Samuelana	
Pump A N: Pump B N: Pump B N: Pump B sec: Pump C N: Pump C Sec: Stirrer speed Pre-stirring time Measurement type Initial auto-stability (mv) Initial auto-stability time (s) Initial stirring Sitrant burette Addition (ml) Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability (mv) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing position Equation type DEFAULT Titration direction Increasing		'
Pump B N: Pump B Sec: Pump C N: Pump C Sec: Stirrer speed Pre-stirring time Measurement type Initial auto-stability (mv) Initial addition Initial stirring Titrant burette Addition type Addition (ml) Limit volume (ml) Polarization value Auto-stability time (s) Auto-stability time (s) Auto-stability time (s) Factor Concentration (mol/I) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type DEFAULT Titration direction Increasing		_
Pump B N: Pump C N: Pump C Sec: Stirrer speed Pre-stirring time Measurement type Initial auto-stability (mv) Initial addition Initial stirring Titrant burette Addition (ml) Limit volume (ml) Polarization value Auto-stability time (s) Auto-stability time (s) Auto-stability time (s) Factor Concentration (mol/l) Result unit Number decimals Approaching factor Blank (ml) Washing type DEFAULT Titration direction O O O O O O O O O O O O O	·	
Pump B sec: 0 Pump C N: 0 Pump C sec: 0 Stirrer speed 8 Pre-stirring time 5 Measurement type mv Initial auto-stability (mv) 5 Initial addition 0.8 (minimum 0.5) Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 0.10 Limit volume (ml) 15.0 Polarization value NA Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation direction Increasing		
Pump C N: Pump C sec: Stirrer speed Pre-stirring time Measurement type Initial auto-stability (mv) Initial addition Initial stirring Titrant burette Addition type Addition (ml) Limit volume (ml) Polarization value Auto-stability time (s) Auto-stability time (s) Factor Concentration (mol/l) Sample volume (ml) Result unit Approaching factor Blank (ml) Washing type Washing type Perstand Perstand O O Result Init Polarization value Auto-stability (mol/l) Result unit Polarization value Auto-stability time (s) Factor Sample volume (ml) Result unit Polarization Washing type Washing position Vashing time (s) Reagent standardization Equation type DEFAULT Titration direction Increasing		_
Pump C sec:0Stirrer speed8Pre-stirring time5Measurement typemvInitial auto-stability (mv)5Initial addition0.8 (minimum 0.5)Initial stirring5Titrant burette1Addition typeConstantAddition (ml)0.10Limit volume (ml)15.0Polarization valueNAAuto-stability (mv)5Auto-stability time (s)2Max. stability time (s)60Factor8.5Concentration (mol/l)0.02Sample volume (ml)0.0Result unit%Number decimals1Approaching factor50Blank (ml)0.000Washing typeWashing positionWashing time (s)5Reagent standardizationNOEquation typeDEFAULTTitration directionIncreasing		-
Stirrer speed 8 Pre-stirring time 5 Measurement type mv Initial auto-stability (mv) 5 Initial auto-stability time (s) 2 Initial addition 0.8 (minimum 0.5) Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 0.10 Limit volume (ml) 15.0 Polarization value NA Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing		-
Pre-stirring time5Measurement typemvInitial auto-stability (mv)5Initial auto-stability time (s)2Initial addition0.8 (minimum 0.5)Initial stirring5Titrant burette1Addition typeConstantAddition (ml)0.10Limit volume (ml)15.0Polarization valueNAAuto-stability (mv)5Auto-stability time (s)2Max. stability time (s)60Factor8.5Concentration (mol/l)0.02Sample volume (ml)0.0Result unit%Number decimals1Approaching factor50Blank (ml)0.000Washing typeWashing positionWashing time (s)5Reagent standardizationNOEquation typeDEFAULTTitration directionIncreasing		-
Measurement typemvInitial auto-stability (mv)5Initial auto-stability time (s)2Initial addition0.8 (minimum 0.5)Initial stirring5Titrant burette1Addition typeConstantAddition (ml)0.10Limit volume (ml)15.0Polarization valueNAAuto-stability (mv)5Auto-stability time (s)2Max. stability time (s)60Factor8.5Concentration (mol/l)0.02Sample volume (ml)0.0Result unit%Number decimals1Approaching factor50Blank (ml)0.000Washing typeWashing positionWashing time (s)5Reagent standardizationNOEquation typeDEFAULTTitration directionIncreasing	-	-
Initial auto-stability (mv) 5 Initial auto-stability time (s) 2 Initial addition 0.8 (minimum 0.5) Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 0.10 Limit volume (ml) 15.0 Polarization value NA Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	_	5
Initial auto-stability time (s) 2 Initial addition 0.8 (minimum 0.5) Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 0.10 Limit volume (ml) 15.0 Polarization value NA Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	7.	mv
Initial addition Initial stirring Titrant burette Addition type Addition (ml) Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability time (s) Factor Concentration (mol/l) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type Titration direction Increasing		
Initial stirring 5 Titrant burette 1 Addition type Constant Addition (ml) 0.10 Limit volume (ml) 15.0 Polarization value NA Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	Initial auto-stability time (s)	2
Titrant burette Addition type Constant Addition (ml) Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability time (s) Factor Concentration (mol/l) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type Washing time (s) Equation type Titration direction O.00 Constant And And And And And And And A	Initial addition	0.8 (minimum 0.5)
Addition type Addition (ml) Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability time (s) Factor Concentration (mol/l) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type Washing type DEFAULT Titration direction 15.0 ANA ANA ANA ANA ANA ANA ANA A	Initial stirring	5
Addition (ml) Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability time (s) Max. stability time (s) Factor Concentration (mol/l) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type Washing time (s) Equation type Titration direction NA NA AA AA AA AB AB AB AB AB	Titrant burette	1
Limit volume (ml) Polarization value Auto-stability (mv) Auto-stability time (s) Max. stability time (s) Factor Concentration (mol/l) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type Washing time (s) Equation type Titration direction NA ANA ADA AO BINA NA NA BINA NA AD AD AD AD AD AD AD AD	Addition type	Constant
Polarization value Auto-stability (mv) Auto-stability time (s) Auto-stability time (s) Max. stability time (s) Factor Concentration (mol/l) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing type Washing time (s) Reagent standardization Equation type DEFAULT Titration direction	Addition (ml)	0.10
Auto-stability (mv) 5 Auto-stability time (s) 2 Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	Limit volume (ml)	15.0
Auto-stability time (s) Max. stability time (s) Factor Concentration (mol/l) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing time (s) Reagent standardization Equation type Jefault Jenerals Auto-stability time (s) 8.5 0.00 % Moleculum (mol/l) 0.00 % Moleculum (mol/l) 0.00 % Moleculum (mol/l) 0.00 Moleculum (mol/l) 0.00 Moleculum (mol/l) 0.000 Mashing factor 50 Blank (ml) 0.000 Washing type Washing position NO Equation type DEFAULT Titration direction Increasing	Polarization value	NA
Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	Auto-stability (mv)	5
Max. stability time (s) 60 Factor 8.5 Concentration (mol/l) 0.02 Sample volume (ml) 0.0 Result unit % Number decimals 1 Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	Auto-stability time (s)	2
Concentration (mol/l) Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing time (s) Reagent standardization Equation type DEFAULT Titration direction O.002 0.000 Washing factor 50 Washing position NO Equation type DEFAULT		60
Sample volume (ml) Result unit Number decimals Approaching factor Blank (ml) Washing type Washing time (s) Reagent standardization Equation type Titration direction O.00 Wood Washing position NO Equation type DEFAULT Increasing	Factor	8.5
Result unit	Concentration (mol/l)	0.02
Number decimals Approaching factor Blank (ml) Washing type Washing time (s) Reagent standardization Equation type Titration direction Increasing	Sample volume (ml)	0.0
Approaching factor 50 Blank (ml) 0.000 Washing type Washing position Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	Result unit	%
Blank (ml) Washing type Washing position Washing time (s) Reagent standardization Equation type DEFAULT Titration direction D.000 NO DEFAULT	Number decimals	1
Blank (ml) Washing type Washing position Washing time (s) Reagent standardization Equation type DEFAULT Titration direction D.000 NO DEFAULT Increasing	Approaching factor	50
Washing type Washing time (s) Reagent standardization Equation type DEFAULT Titration direction Increasing		0.000
Washing time (s) 5 Reagent standardization NO Equation type DEFAULT Titration direction Increasing	, ,	Washing position
Reagent standardization NO Equation type DEFAULT Titration direction Increasing		
Equation type DEFAULT Titration direction Increasing		
Titration direction Increasing		DEFAULT
		Increasing
	Minimum derivative	10

The titer of the hydrogen peroxide is expressed here in % by weight

For viscous products, the procedure is to weigh 2-3 grams, bring to a volume of 1 liter with water and analyze 25 ml directly in the titration beaker. The factor 8.5 must be multiplied by the dilution factor 40, and therefore the factor to be inserted in the method will be $8.5 \times 40 = 340$.

For liquids (commercial hydrogen peroxide at 3%), it is also possible to by volume, entering the value in the method, e.g. 1 ml of sample and adding about 30 ml of distilled water.

The initial addition cannot be less than 0.5 ml, because at the beginning of the titration there is a momentary potential change (with evident pink coloring in the titration beaker) for a few seconds, which would otherwise be interpreted by the Flash as an end of titration inflection point.

NOTE:

Some parameters of the program shown here have been compiled as an indication: they can be optimized according to the operating conditions and the samples analyzed, in order to improve the accuracy and/or speed of the analysis.

STEROGLASS Srl shall not be liable for errors or damage due to the negligence of the operator, the failure to read the instructions contained in this manual or for damages caused by the supply, performance or use of this product.

STEROGLASS SrI reserves the right to make changes and/or deletions to this manual without notice.

All rights reserved. The contents of this publication may not be reproduced in any way or used in any form without the written permission of STEROGLASS Srl.