

Iron and Steel

Acid Consumption of Detergent

Acid•base titration by
Automatic Potentiometric Titrator

Standard

1. Abstract

The acid consumption of detergent is determined by potentiometric titration with 0.1mol/L Hydrochloric acid up to the endpoint, which is the maximum inflexion on titration curve.

The acid consumption is calculated from titration volume of Hydrochloric acid.

2. Reference

- 1) Experiment and Calculation for Quantitative Analysis- Vol.2 by Seiji Takagi from Kyoritsu Publishing Company

3. Cautions in measurement

- 1) Handle with care when you work on chemicals.

4. Post-measurement care

Clean the electrode with pure water, and keep it dipped in water for use in next measurement.

5. Test equipment

Main unit : Automatic potentiometric titrator (Standard preamplifier: STD-)

Electrode : Option glass electrode

Option Ceramic type reference electrode

Standard Temperature compensation electrode

6. Reagent

Titrant : 0.1 mol/L Hydrochloric acid (f=1.00)

Solvent : Pure water

7. Measurement procedure

—Measurement—

- 1) Prepare 5.0mL of sample in a 200mL beaker.
- 2) Add 100mL pure water.
- 3) Titrate with 0.1mol/L Hydrochloric acid to obtain the acid consumption.

8. Formula

Acid consumption (g/L) = (EP2 - BL1) × FA1 × C1 × K1 / SIZE

EP2 : Titration volume (mL)

BL1 : Blank level (0.00mL)

FA1 : Factor of titrant (1.00)

C1 : Concentration conversion coefficient (4.0)
(0.1mol/L HCl 1mL ≡ 4.0mg NaOH)

K1 : Unit conversion coefficient (1)

SIZE : Sample size (mL)

9. Example of measurement

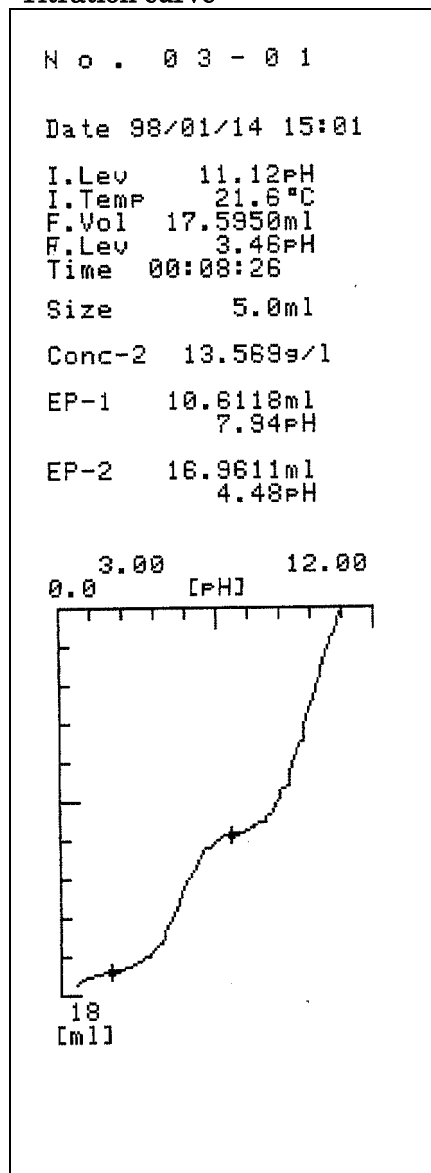
— Ambient condition —

Room temperature : 20 °C	Humidity : 56 %	Weather : Rainy
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- Titration parameter -

Model : AT-400	
Method No. : 18	
Titration mode : Auto Titr	
Titration form : EP Stop	
[TITR. PARA]	[CALCU. PARA]
Form : EP Stop	Sample Measurement
Buret No. : 1	Conc1 CalcuNo. 2
Preamp : STD	Conc1 Dim. [g/L]
Detector No. : 1	Conc1 EP Position 2
Dimension : pH	Data [f(EP2-Blank)]
Max.Vol : 20.0mL	T.Type [Normal]
W.Time : 0s	Data [f(T.Vol)]
Direction : Auto	Local Blank
	Blank 0.0mL
[CTRL. PARA]	Common T.Factor
End Point No. : 2	K1 1
S(dE) : 50	C1 4.0mg/mL
S(E/mL) : 100	Temp.Comp. [Off]
O.Titr : 0mL	
Gain : 1	
C.Speed : 2.0	
S.Pot : 4.0mV	
M.Unit : 0.5mL	
Separation : Off	
A.Simulation : Off	

-Titration curve-



(The above printout data were obtained from titration by AT-400)

« TITR. PARA: Titration parameter »

Form: of titration / Buret No.: the burette used in titration / Detector No.: the detector used in titration
Dimension: potential unit/ Max Volume: of titration / Wait Time: before titration starts / Direction.: of titration

« CTRL. PARA: Control parameter »

End Point No. number of EPs detected / S(dE): EP potential (difference) / S(E/mL): EP potential (differential)
Over Titr.Vol. over-titration volume / Gain: sensitivity of detection signal/ C.Speed: dose speed/ S.Pot.: potential changes of sampling signal / Separation: of potential / A.Simulation: redetection of EP

« CALCU. PARA: Result parameter »

Calc.No.: of formula / Conc.1: formula 1 / Conc1 Dim: unit of concentration/Conc1EP Position: EP at conc. 1
K1: unit conversion coefficient/ Factor: of reagent / Blank : blank level / Data: titration form used in calculation
T.Type: titration type (normal or back) / Common T.Factor: factor of titrant registered
C1(mg/mL): conc. at EP1/Data: calculation of titration / Temp.Comp.: temperature compensation

–Measurement results–

n	Sample (mL)	Titration (mL)	Acid consumption (g/L)	Statistics	
				Mean	
1	<u>5.0</u>	<u>16.9611</u>	<u>13.569</u>	Mean	13.567 g/L
2	5.0	16.9493	13.559	SD	0.008 g/L
3	5.0	16.9670	13.574	RSD	0.056 %

* The above results were obtained by 3 tests of the same sample.

* Red underline shows the data from page 3/4.

10.Summary

Detergent is a cleaning fluid like water or wash powder to remove dirt or stains.
Acid consumption also called Alkalinity is the amount of acid required in neutralization.

The sample test shows a good repeatability of 0.06%relative standard deviation.

The automated potentiometry assures precise and reliable measurement.