1.Abstract

Boric acid in pesticide is quantified according to JIS K 8863-2007 Boric Acid (Reagent).

After D-Mannitol and water are added to the sample for extraction, it is titrated with sodium hydroxide up to the endpoint. Direct titration for boric acid is difficult because boric acid hardly dissociates acid. Polyols such as mannitol form complexes with boric acid and release hydrogen ions. This operation makes neutralization titration for boric acid possible. The endpoint is the inflexion point on titration curve. The boric acid in pesticide is calculated from titration volume.

2.Reference

- 1) JIS K 8863-2007 Boric Acid (Reagent)
- 2) ISO 6353-3:1987 Reagents for chemical analysis -- Part 3: Specifications -- Second series

3. Cautions in measurement

1) Since specimen may not be homogeneous, stir well before it is sampled.

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 pH glass electrode

Option Ceramic type reference electrode
Standard Temperature compensation electrode

6.Reagent

Titrant : lmo1/L Sodium hydroxide

Solvent : Pure water Reagent : D-Mannitol

7. Measurement procedure

-Measurement-

- 1) Deliver 2g sample and 3g D-Mannitol in a 200mL beaker, and add 100mL of pure water
- 2) Extract in an ultrasonic cleaner for 30 minutes.
- 3) Titrate with 1mol/L Sodium hydroxide to obtain concentration of boric acid.

8. Formula

Concentration (%) = (EP1 - BL1) \times TF \times C1 \times K1 / SIZE

EP1 : Titration volume (mL)
BL1 : Blank level (0.0mL)
TF : Factor of titrant (1.001)

C1 : Concentration conversion coefficient (61.83mg/mL)

(Boric acid in mg equivalent to 1mL of 1mo1/L NaOH)

K1 : Unit conversion coefficient (0.1)

SIZE : Sample size (g)

9.Example of measurement

-Ambient condition-

Room temperature : 21 °C	Humidity: 34 %	Weather : Fair
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- Titration parameter -

:	AT-510
Method No.	
:	Auto Titr
:	EP Stop
	o. :

Form : EP Stop | Calc.Type : Sample APB No. : 1 | Conc.1 : Set

Unit No. : 1 CO1=

Detector No. : 1 (EP1-BL1)*TF*C1*K1/SIZ Unit : mV

Max.Volume : 20.0mL
Wait Time : 0s

Wait Time : 0s Unit : %
Direction : Auto EP No. : 1
Temp.Comp. : Off

<Control> <Constant>

End Point No. : 1 C1(mg/mL) : 61.83 End sense : Auto K1 : 0.1

End Point Area : Off Separation : Off

Over Titr.Vol. : 0mL

Gain : 1 Data samp.Pot. : 4.0mV

 $\begin{array}{ll} Data \; samp. Vol. \; \vdots & 0.5mL \\ Control \; Speed \; \; \vdots \; \; Medium \end{array}$

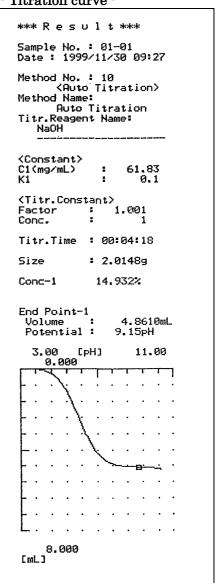
[Blank list]

[Titr. constant]

Blank1 : 0.0

Factor : 1.001

- Titration curve -



(The above printout data are obtained from titration by AT-510)

≪Titration parameter≫

Form: of titration / APB No. the burette used in titration / Unit No.: APB Unit File number

Detector No.: the detector used in titration / Max Volume. of titration / Wait Time: before titration starts

Direction: of titration

≪Control parameter≫

End Point No. number of EPs detected /End sense: direction of EP/ End Point Area: EP detection area Separation: of potential / Over Titr.Vol. over-titration volume / Gain: sensitivity of detection signal Data samp.Pot.: potential changes of sampling signal / Data samp.Vol.: titration volume of sampling signal Control Speed: of titration

≪Result parameter≫

Calc.Type: of formula / Conc.1: formula 1 / Unit: of result /EP No.:for calculation
Temp.Comp. temperature compensation of titration liquid/ C1(mg/mL) concentration conversion coefficient
K1: unit conversion coefficient/ Factor: of reagent / Blank 1: blank level 1

-Measurement results-

n	Sample (g)	Titration (mL)	Concentration (%)	
1	2.0148	4.8610	14.932	
2	2.0060	4.9123	15.156	
3	2.0145	4.8974	15.046	

Concentration		
Mean	15.045 %	
SD	0.112 %	
RSD	0.745 %	

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

10.Summary

Boric acid (H₃BO₃, molecular mass: 61.83) is the material of antiseptic and pesticide as well as eye lotion when diluted with water.

Boric acid pesticide is a popularly known chemical against roaches, where boric acid is mixed in a form of rice dumpling as bait for roaches.

The content of boric acid in commercially sold pesticide ranges from 5 to 70%.

The sample measurement shows a good repeatability with 0.7% relative standard deviation. Precise and reliable measurement is assured by the automated potentiometric titration.



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