

Agricultural
Chemicals

Boric Acid in Pesticide

Acid-base titration by
Automatic Potentiometric Titrator

Standard	JIS	K 8863
	ISO	6353-3

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 : 1mol/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) × TF × C1 × 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 1mol/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 -

Model : AT-510	
Method No. : 10	
Titr.mode : Auto Titr	
Titr.form : EP Stop	
<Titration>	<Calculation>
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	E
Max. Volume : 20.0mL	
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	[Titr. constant]
Over Titr.Vol. : 0mL	Factor : 1.001
Gain : 1	
Data samp.Pot. : 4.0mV	
Data samp.Vol. : 0.5mL	[Blank list]
Control Speed : Medium	Blank1 : 0.0

- Titration curve -

*** Result ***	
Sample No. : 01-01	
Date : 1999/11/30 09:27	
Method No. : 10	
<Auto Titration>	
Method Name:	
Auto Titration	
Titr.Reagent Name:	
NaOH	

<Constant>	
C1(mg/mL) : 61.83	
K1 : 0.1	
<Titr.Constant>	
Factor : 1.001	
Conc. : 1	
Titr.Time : 00:04:18	
Size : 2.0148g	
Conc-1 : 14.932%	
End Point-1	
Volume : 4.8610mL	
Potential : 9.15pH	
3.00 [pH] 11.00	
0.000	
8.000	
[mL]	

(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	<u>2.0148</u>	<u>4.8610</u>	<u>14.932</u>
2	<u>2.0060</u>	<u>4.9123</u>	<u>15.156</u>
3	<u>2.0145</u>	<u>4.8974</u>	<u>15.046</u>

Concentration	
Mean	15.045 %
SD	0.112 %
RSD	0.745 %

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

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

10. Summary

Boric acid (H_3BO_3 , 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.