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Sodium hydroxide (Reagent)

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Classification	3
4 Properties	3
4.1 Characteristics	3
4.2 Qualitative test method	3
5 Quality	3
6 Test methods	4
6.1 General matters	4
6.2 Assay (NaOH) and sodium carbonate (Na ₂ CO ₃)	4
6.3 Water solubility	6
6.4 Chloride (Cl)	7
6.5 Phosphate (PO ₄)	7
6.6 Silicate (as SiO ₂)	9
6.7 Sulfate (SO ₄)	10
6.8 Nitrogen compound (as N)	11
6.9 Potassium (K)	16
6.10 Magnesium (Mg), calcium (Ca), zinc (Zn), aluminium (Al), lead (Pb), iron (Fe) and nickel (Ni)	17
6.11 Magnesium (Mg) and calcium (Ca)	20
6.12 Zinc (Zn), lead (Pb), iron (Fe) and nickel (Ni)	21
6.13 Arsenic (As)	23
7 Container	26
8 Marking	26
Annex JA (informative) Comparison table between JIS and corresponding International Standard	27

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Reagent Association (JRA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS K 8576:2006** is replaced with this Standard.

However, **JIS K 8576:2006** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until August 19, 2019.

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Sodium hydroxide (Reagent)

NaOH FW : 40.00

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 6353-2:1983**, Edition 1, with some modifications of the technical contents.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard gives specifications of sodium hydroxide intended for use as a reagent.

WARNING 1 Sodium hydroxide is a deleterious substance, and its contact with eyes, mucous membrane or skin should be prevented with utmost care. Pay attention to the ventilation, because heat and strong irritating mist is generated when water is added to sodium hydroxide.

WARNING 2 Persons carrying out tests based on this Standard should be familiar with normal laboratory practice. This Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the persons using this Standard to establish appropriate safety and health practices by reference to SDS (safety data sheets), etc.

NOTE The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 6353-2:1983 *Reagents for chemical analysis—Part 2: Specifications—First series R34 Sodium hydroxide* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS K 0050 *General rules for chemical analysis*

JIS K 0113 *General rules for methods of potentiometric, amperometric, coulometric, and Karl Fischer titrations*

JIS K 0115 *General rules for molecular absorptiometric analysis*

JIS K 0116 *General rules for atomic emission spectrometry*

JIS K 0121	<i>General rules for atomic absorption spectrometry</i>
JIS K 0970	<i>Piston pipettes</i>
JIS K 8001	<i>General rules for test methods of reagents</i>
JIS K 8012	<i>Zinc (Reagent)</i>
JIS K 8034	<i>Acetone (Reagent)</i>
JIS K 8044	<i>Diarsenic trioxide (Reagent)</i>
JIS K 8051	<i>3-Methyl-1-butanol (Reagent)</i>
JIS K 8060	<i>Sodium sulfite heptahydrate (Reagent)</i>
JIS K 8085	<i>Ammonia solution (Reagent)</i>
JIS K 8102	<i>Ethanol (95) (Reagent)</i>
JIS K 8107	<i>Disodium dihydrogen ethylenediamine tetraacetic acid dihydrate (Reagent)</i>
JIS K 8121	<i>Potassium chloride (Reagent)</i>
JIS K 8136	<i>Tin(II) chloride dihydrate (Reagent)</i>
JIS K 8150	<i>Sodium chloride (Reagent)</i>
JIS K 8152	<i>Nickel (II) chloride hexahydrate (Reagent)</i>
JIS K 8155	<i>Barium chloride dihydrate (Reagent)</i>
JIS K 8180	<i>Hydrochloric acid (Reagent)</i>
JIS K 8255	<i>Aluminium potassium sulfate 12-water (Reagent)</i>
JIS K 8284	<i>Diammonium hydrogen citrate (Reagent)</i>
JIS K 8355	<i>Acetic acid (Reagent)</i>
JIS K 8374	<i>Lead (II) acetate trihydrate (Reagent)</i>
JIS K 8377	<i>Butyl acetate (Reagent)</i>
JIS K 8454	<i>Sodium N,N-diethyldithiocarbamate trihydrate (Reagent)</i>
JIS K 8532	<i>L(+)-Tartaric acid (Reagent)</i>
JIS K 8541	<i>Nitric acid (Reagent)</i>
JIS K 8548	<i>Potassium nitrate (Reagent)</i>
JIS K 8550	<i>Silver nitrate (Reagent)</i>
JIS K 8563	<i>Lead (II) nitrate (Reagent)</i>
JIS K 8580	<i>Tin (Reagent)</i>
JIS K 8617	<i>Calcium carbonate (Reagent)</i>
JIS K 8625	<i>Sodium carbonate (Reagent)</i>
JIS K 8637	<i>Sodium thiosulfate pentahydrate (Reagent)</i>
JIS K 8653	<i>Devarda's alloy (Reagent)</i>
JIS K 8659	<i>Starch, soluble (Reagent)</i>
JIS K 8777	<i>Pyridine (Reagent)</i>

JIS K 8798	<i>Phenol (Reagent)</i>
JIS K 8799	<i>Phenolphthalein (Reagent)</i>
JIS K 8810	<i>1-Butanol (Reagent)</i>
JIS K 8844	<i>Bromophenol blue (Reagent)</i>
JIS K 8885	<i>Silicon dioxide (Reagent)</i>
JIS K 8905	<i>Ammonium molybdate tetrahydrate (Reagent)</i>
JIS K 8913	<i>Potassium iodide (Reagent)</i>
JIS K 8951	<i>Sulfuric acid (Reagent)</i>
JIS K 8953	<i>Zinc sulfate heptahydrate (Reagent)</i>
JIS K 8962	<i>Potassium sulfate (Reagent)</i>
JIS K 8982	<i>Ammonium iron (III) sulfate 12-water (Reagent)</i>
JIS K 8995	<i>Magnesium sulfate heptahydrate (Reagent)</i>
JIS K 9007	<i>Potassium dihydrogen phosphate (Reagent)</i>
JIS K 9512	<i>Silver N,N-diethyldithiocarbamate (Reagent)</i>
JIS Z 8802	<i>Methods for determination of pH of aqueous solutions</i>

3 Classification

This Standard applies to sodium hydroxide of guaranteed grade.

4 Properties

4.1 Characteristics

Sodium hydroxide is white granular and deliquescent, and absorbs carbon dioxide. It easily dissolves in water, and dissolves in ethanol (99.5).

4.2 Qualitative test method

In the flame test as a qualitative test, immerse the tip (about 30 mm) of a platinum wire of about 0.8 mm in diameter in hydrochloric acid (1+1), put it in the colourless flame of gas burner of which the flame length is about 120 mm and the inner flame length is about 30 mm, and allow it to cool. Repeat this operation until the colour in flame is not recognizable anymore. Dissolve 2 g of the sample with water and dilute it to 20 ml, and immerse the tip (about 5 mm) of platinum wire in this solution. Putting it in the colourless flame of the gas burner gives yellow colouration of the flame.

5 Quality

When tested in accordance with Clause 6, the quality shall conform to Table 1.

Table 1 Quality

Item	Specification		Test method
Assay (NaOH)	mass fraction %	97.0 min.	6.2
Sodium carbonate (Na ₂ CO ₃)	mass fraction %	1.0 max.	6.2
Water solubility	—	Conformed to test	6.3
Chloride (Cl)	mass fraction %	0.005 max.	6.4
Phosphate (PO ₄)	mass fraction %	0.001 max.	6.5
Silicate (as SiO ₂)	mass fraction %	0.01 max.	6.6
Sulfate (SO ₄)	mass fraction %	0.005 max.	6.7
Nitrogen compound (as N)	mass fraction %	0.001 max.	6.8
Potassium (K)	mass fraction %	0.05 max.	6.9
Magnesium (Mg)	mass fraction ppm	5 max.	6.10 or 6.11
Calcium (Ca)	mass fraction %	0.002 max.	6.10 or 6.11
Zinc (Zn)	mass fraction %	0.001 max.	6.10 or 6.12
Aluminium (Al)	mass fraction %	0.002 max.	6.10
Lead (Pb)	mass fraction ppm	5 max.	6.10 or 6.12
Arsenic (As)	mass fraction ppm	1 max.	6.13
Iron (Fe)	mass fraction ppm	5 max.	6.10 or 6.12
Nickel (Ni)	mass fraction %	0.001 max.	6.10 or 6.12

6 Test methods

6.1 General matters

General matters of test methods shall be in accordance with **JIS K 0050** and **JIS K 8001**.

6.2 Assay (NaOH) and sodium carbonate (Na₂CO₃)

The test method of assay (NaOH) and sodium carbonate (Na₂CO₃) shall be as follows.

a) **Solutions for testing** The following solutions shall be used for testing.

- 1) **Barium chloride solution (100 g/L)** Weigh out 11.7 g of barium chloride dihydrate specified in **JIS K 8155**, add water to dissolve, and dilute to 100 ml with water.
- 2) **Carbon dioxide-free water**, prepared in accordance with **5.8 c)** of **JIS K 8001**.
- 3) **Phenolphthalein solution** Weigh out 1.0 g of phenolphthalein specified in **JIS K 8799**, add 90 ml of ethanol (95) specified in **JIS K 8102** to dissolve, and dilute to 100 ml with water.
- 4) **Bromophenol blue solution** Weigh out 0.10 g of bromophenol blue specified in **JIS K 8844**, dissolve in 50 ml of ethanol (95) specified in **JIS K 8102**, and dilute to 100 ml with water.
- 5) **1 mol/L hydrochloric acid** (HCl: 36.46 g/L), prepared, standardized and calculated in accordance with **JA.6.4 e) 2)** of **JIS K 8001** (1 mol/L hydrochloric acid)

using hydrochloric acid (guaranteed) specified in **JIS K 8180**. Preserve it in a bottle made of resin such as polyethylene.

b) **Apparatus**, mainly used in testing shall be as follows.

- **Automatic titrator**, having the potentiometric titration function, of which the minimum discharge amount is 0.01 ml or under.

c) **Operation** As follows.

- 1) Weigh out 1.5 g of the sample to the nearest 0.1 mg and take it in a 200 ml Erlenmeyer flask with interchangeable ground joint, add 50 ml of carbon dioxide-free water to dissolve, add 10 ml of barium chloride solution (100 g/L), and leave to stand for 5 min.
- 2) The sample shall be titrated according to either of the following methods.
 - 2.1) Add three drops of phenolphthalein solution as an indicator and titrate it with 1 mol/L hydrochloric acid. Take the point where the colour (red) of the solution vanishes as the end point. Successively, add three drops of bromophenol blue solution as an indicator and titrate with 1 mol/L hydrochloric acid. Take the point where the colour of the solution turns to reddish yellow as the end point.
 - 2.2) In accordance with Clause 5 of **JIS K 0113**, carry out the titration using 1 mol/L hydrochloric acid but not using an indicator, in which a platinum electrode or silver electrode is used as the indicator electrode while a silver-silver chloride electrode is used as the reference electrode, or the composite electrode that is the combination of the indicator electrode and the reference electrode is used. Take the inflection point between the first and second steps of titration curve as the end point.
- d) **Calculation** The mass fractions of assay (NaOH) and sodium carbonate (Na₂CO₃) are obtained according to the following formulae:

$$A = \frac{0.040\,00 \times a \times f}{m} \times 100$$

$$B = \frac{0.053\,00 \times (b - a) \times f}{m} \times 100$$

where,

A : assay (NaOH) (mass fraction %);

B : sodium carbonate (Na₂CO₃) (mass fraction %);

a : volume of 1 mol/L hydrochloric acid required for titration of first step (ml);

b : volume of 1 mol/L hydrochloric acid required for titration in total (ml);

f : factor of 1 mol/L hydrochloric acid;

m : mass of sample weighed out (g);

0.040 00 : conversion factor for indication of mass of NaOH corresponding to 1 ml of 1 mol/L hydrochloric acid (g/ml);

0.053 00 : conversion factor for indication of mass of Na_2CO_3 corresponding to 1 ml of 1 mol/L hydrochloric acid (g/ml).

6.3 Water solubility

The test method of water solubility shall be as follows.

a) **Solutions for testing** The following solutions shall be used for testing.

- 1) **Nitric acid (1+2)** Mix 1 volume of nitric acid (guaranteed, 60 % to 61 % in mass fraction) specified in **JIS K 8541** and 2 volumes of water.
- 2) **Silver nitrate solution (20 g/L)** Weigh out 2 g of silver nitrate specified in **JIS K 8550**, add water to dissolve, and dilute to 100 ml with water. Preserve it in a brown glass bottle.
- 3) **Chloride reference solution (Cl: 0.01 mg/ml)**, in accordance with **JA.4** of **JIS K 8001**.

As the preparation of chloride reference solution (Cl: 0.01 mg/ml), weigh out 1.65 g of sodium chloride specified in **JIS K 8150** in 1 000 ml volumetric flask, add water to dissolve, and add water to the marked line to mix. Take accurately 10 ml of this solution in 1 000 ml volumetric flask, and add water to the marked line to mix.

b) **Conformity limit standard for turbidity** For the conformity limit standard for turbidity, “clear” shall apply.

The solution to which “clear” is applicable as the conformity limit standard shall be prepared as follows; weigh out 0.2 ml of chloride reference solution (Cl: 0.01 mg/ml) in a flat-bottomed test tube with interchangeable ground joint [see **c**)], add 10 ml of water, 1 ml of nitric acid (1+2) and 1 ml of silver nitrate solution (20 g/L), dilute to 20 ml with water, shake to mix, and leave to stand for 15 min.

c) **Instruments**, mainly used in testing are as follows.

- **Flat-bottomed test tube with interchangeable ground joint** For example, that of 50 ml in capacity and of about 23 mm in diameter, having a scale.

d) **Operation** As follows.

- 1) Weigh out 2.0 g of the sample and take it in a flat-bottomed test tube with interchangeable ground joint, add water to dissolve, and dilute to 20 ml with water.
- 2) Immediately, compare the turbidity of the sample solution with that of the solution prepared in **b**). Also, examine the solution for the existence of foreign matters such as dirt and suspended solids from above or side of the flat-bottomed test tube with interchangeable ground joint.

e) **Judgment** When **1**) and **2**) below are conformed, apply “water solubility: conformed to test (specification)”.

- 1) The turbidity of the sample solution is not greater than that of **b**).
- 2) Almost no foreign matters such as dirt and suspended solids are observed.

6.4 Chloride (Cl)

The test method of chloride (Cl) shall be as follows.

- a) **Solutions for testing** The following solutions shall be used for testing.
- 1) **Nitric acid (1+2)**, in accordance with **6.3 a) 1)**.
 - 2) **Silver nitrate solution (20 g/L)**, in accordance with **6.3 a) 2)**.
 - 3) **Chloride reference solution (Cl: 0.01 mg/ml)**, in accordance with **6.3 a) 3)**.
- b) **Instruments**, mainly used in testing are as follows.
- **Flat-bottomed test tube with interchangeable ground joint**, in accordance with **6.3 c)**.
- c) **Operation** As follows.
- 1) Weigh out 40 g of the sample and take it in 200 ml beaker made of resin, add 100 ml of water to dissolve, cool, and dilute to 200 ml with water. Immediately, transfer the solution into a bottle made of resin such as polyethylene not containing calcium-plasticizing agent, capable of stoppering tightly (Solution A). (Also used in **6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.12** and **6.13**.)
 - 2) As the preparation of the sample solution, take 2.0 ml of Solution A (0.4 g as amount of sample) in a flat-bottomed test tube with interchangeable ground joint, add 10 ml nitric acid (1+2), and dilute to 25 ml with water.
 - 3) As the preparation of the comparison solution, take 2.0 ml of chloride reference solution (Cl: 0.01 mg/ml) and 10 ml of nitric acid (1+2) in a flat-bottomed test tube with interchangeable ground joint, and dilute to 25 ml with water.
 - 4) Add 1 ml of silver nitrate solution (20 g/L) to the sample solution and the comparison solution, shake to mix, and leave to stand for 15 min.
 - 5) Compare the turbidity of the solution obtained from the sample solution and that from the comparison solution by observing both solutions against a black background from above or side of the flat-bottomed test tube with interchangeable ground joint.
- d) **Judgement** When the turbidity of the solution obtained from the sample solution is not darker than the white turbidity of the solution obtained from the comparison solution, apply “chloride (Cl): mass fraction 0.005 % max. (specification)”.

6.5 Phosphate (PO₄)

The test method of phosphate (PO₄) shall be as follows.

- a) **Solutions for testing** The following solutions shall be used for testing.
- 1) **Hydrochloric acid (2+1)** Mix 2 volumes of hydrochloric acid (guaranteed) specified in **JIS K 8180** and 1 volume of water.
 - 2) **Tin (II) chloride solution (for phosphate determination)** Weigh out 40 g of tin (II) chloride dihydrate specified in **JIS K 8136**, and add 60 ml of hydrochloric acid (arsenic analytical grade) specified in **JIS K 8180** to dissolve. Take 1 ml