DRAFT TANZANIA STANDARD

TBS/CDC-2(5104) P2 Sodium hypochlorite solutions — Specification (Revision of TZS 369: 2002)

TANZANIA BUREAU OF STANDARDS

0 Foreword

This Draft Tanzania Standard is being developed by the Soap and Detergents Technical Committee under supervision of the Chemical Division Standards Committee and it is in accordance with the procedures of the Bureau.

This Draft Tanzania Standard is the first revision of TZS 369: 2002 “Sodium hypochlorite Solution – Specification”; the major changes in this second edition is an addition of nominal concentration of 3.5% (m/v) sodium hypochlorite solution, for domestic use (clause 4.1c)).

In the preparation of this Draft Tanzania Standard assistance was drawn from MS 78:1997, *Specification for sodium hypochlorite solutions* published by Mauritius Bureau of Standards; and
SANS 296: 2010 *Sodium hypochlorite solution – Specification*, published by South African Bureau of Standards.

In reporting the results of analysis of a test if the final value is to be rounded off, it shall be done in accordance with TZS 4 *Rounding off numerical values.*

DRAFT TANZANIA STANDARD TBS/CDC 2(5104) P3

Sodium hypochlorite solutions — Specification

1 Scope

This Draft Tanzania Standard specifies the requirements, sampling and methods of testing an aqueous solution of sodium hypochlorite for industrial and domestic use.

2 Normative references

The following referenced documents are indispensable for the application of this document. The latest edition of the referenced document (including any amendments) applies.

TZS 59 *Water for analytical laboratory use – Specification and test method*

TZS 801 *Disinfectants – Specification*

3 Terms and definitions

For the purposes of this Tanzania Standard, the following terms and definitions shall apply:

3.1 available chlorine

quantity of chlorine chemically equivalent to the oxygen that would be released during the complete decomposition of the sodium hypochlorite to sodium chloride and oxygen.

NOTE 1- This is a conventional way of expressing the concentration of sodium hypochlorite solution. The available chlorine is 0.95 times the sodium hypochlorite content and is a measure of the oxidising power of sodium hypochlorite solutions.

3.2 batch

material from a single mix or, in the case of a continuous production process, the material from a single shift production

3.3 defective

solution or a container that fails in one or more respects to comply with the relevant requirements of the specification

3.4 lot
no less than 25 and not more than 5 000 containers, or one tanker, of sodium hypochlorite solution, from the same batch, from one manufacturer, submitted at any one time for inspection and testing

3.5 nominal concentration
minimum available chlorine content of the sodium hypochlorite solution under test, at the time of manufacture

4 Requirements

4.1 General

Sodium hypochlorite solution shall be of one of the following nominal concentrations, as required (see **Annex E**):

a) 15% (m/v) for industrial use;
b) 5% (m/v) for domestic use; or
c) 3.5% (m/v) for domestic use.

4.2 Sodium hypochlorite solution for industrial use

4.2.1 *General*

The solution shall be a clear liquid and shall be miscible in all proportion with distilled water.

4.2.2 *Physical and chemical requirements*

The solution shall comply with the requirements given in table 1.

Table 1 — **Physical and chemical requirements for a sodium hypochlorite solution for industrial use**

S/No:	Parameter	Requirement	Test method
i	Sediment content, % (mass fraction expressed as a percentage), max	0.1	Annex B
ii	Available chlorine content determined on the date of manufacture, % (m/v), min	15	Annex C
iii	Available chlorine content determined on the 14^{th}day ± 2 d after date of manufacture, % (m/v), min	13	Annex C
iv	Sodium hydroxide content, % (m/v),	1.5	Annex D

4.2.3 *Stability*

When (after receipt) the solution is kept in a dark place at a temperature of 20°C -27°C, the available chlorine content, determined in accordance with **Annex C** on the 14th day± 2 d after date of manufactured, shall be at least 13 % (m/v).

4.3 Sodium hypochlorite solutions for domestic use

4.3.1*General*

4.3.1.1 The solution shall be a clear liquid that is free from sediment and suspended matter other than laundry blue. A solution shall be considered to be clear if the small amount of salts that have crystallized from the solution dissolves completely when the solution is mixed with twice its volume of distilled water.

4.3.1.2 When so specified by the purchaser, the solution may contain laundry blue. Settling of the laundry blue on standing shall be permitted but the blue shall disperse completely in the solution when the solution, in the original container, is shaken for 30s.

4.3.2 *Physical and chemical requirements*
The solution shall comply with the requirements given in Table 2

Table 2 — **Physical and chemical requirements for a sodium hypochlorite solution for domestic use**

S/No:	Property	Requirement	Test method
i	Sediment content, % (mass fraction expressed as a percentage), max	0.1	Annex B
ii	Available chlorine content determined within 14 days ± 2 d of the date of manufacture, % (m/v), min 5 % nominal concentration 3.5 % nominal concentration	 5.0 3.5	Annex C
iii	Available chlorine content determined from 14th to the 60th day ± 2 d of the date of manufacture, % (m/v), min 5 % nominal concentration 3.5 % nominal concentration	 4.5 3.2	Annex C
iv	Sodium hydroxide content, % (m/v),	0.5	Annex D

4.3.3*Stability*

When the solution is kept in a dark place at a temperature of 20°C -27°C from 14th to the 60th day after date of manufacture, the available chlorine content, determined in accordance with **Annex C** on the 60th day after date of manufacture, shall be as follows:

a) solutions of 5 % nominal concentration: not less than 4.5 % (m/v); and

b) solutions of 3.5 % nominal concentration: not less than 3.2 % (m/v).

4.4 Disinfecting efficacy

Products intended for disinfection, shall pass the tests, when tested according to annexes C and D of TZS 801

5 Packing and marking

5.1 Packing

Sodium hypochlorite solution shall (except when delivered in tankers) be packed in non-transparent sealed plastic containers. Only solution from the same batch shall be packed in the same container and, when relevant, in the same pack.

5.2 Marking

Each container (other than a tanker) shall be legibly and indelibly marked in, Kiswahili and English, and other language as agreed between the manufacturer and supplier with the following information:

a) the manufacturer's name and trade-mark;
b) the words '**Sodium hypochlorite', 'bleach'** or '**Disinfectant**';
c) the nominal available chlorine content;
d) the batch identification (which may be given in code);
e) the net volume of the contents;
f) dates of manufacture and expiry
g) the words '**Store in a cool place and not in direct sunlight';**
h) in the case of a sodium hypochlorite solution for industrial use, the date of despatch from the manufacturer's factory and
i) recommended use of dilution and specific instruction for safe use and safety information;
j) in the case of individual containers of sodium hypochlorite solutions for domestic use, the following additional information:
    1) the instructions for use,
    2) the words '**Do not use on wool, silk, rayon, leather and dyed garments**' **[1)].**
k) Warning: '**In case of direct contact with skin and/or eyes, wash with plenty of water'**.

6 Sampling and compliance with the specification[2)]

6.1 Sampling

The following sampling procedure shall be applied in determining whether a lot, submitted for inspection and testing, complies with the relevant requirements of the specification. The sample so drawn shall be deemed to represent the lot.

6.1.1*Sampling from tankers*

From four levels in the tanker, or at four stages during the filling of the tanker, take equal increments that make up a composite sample of about 500 ml. Mix, divide this sample in two equal portions, and place each portion in a 250-ml amber bottle that is fitted with a ground-glass stopper. Use one portion for the determination of the sediment, the available chlorine, and the sodium hydroxide contents (see **A.2**), and reserve the other portion for the determination of the stability (see **A.3**).

6.1.2 *Sampling from other containers*

After checking the lot for compliance with the relevant requirements of 5.1 and 5.2, take from it at random the number of containers shown in column 2 of Table 3 relative to the appropriate lot size given in column 1. Reserve half of the containers for the determination of the sediment (when relevant), the available chlorine, and the sodium hydroxide contents
(see **A.2**), and the other half for the determination of the stability (see **A.3**).

1) Sodium hypochlorite may have a deleterious effect on certain resin-treated materials, such as crease-resistant, drip-dry, embossed, and glazed fabrics. Coloured fabrics will lose their colour if their dyes are not colour fast to hypochlorite.

2) This section applies to the sampling for inspection and testing before acceptance or rejection of single lots (consignments) in cases where no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of the lot. It is also used as the procedure for adjudicating in cases of dispute.

Table 3– Sample sizes

1	2
Lot size	Sample size
Number of containers	Number of containers
25-50 51-100 101-500 501 – 1 500 1 501 – 5 000	4 6 8 10 12

6.2 Compliance with the specification

The lot shall be deemed to comply with the requirements of the specification if, after inspection of the containers and testing of the sample taken in accordance with 6.1, no defect is found.

7 Inspection

Inspect the containers taken in accordance with 6.1.2 for compliance with the requirements given in clause 4.

Annex A
(Normative)

Test specimens

A.1 Unless otherwise specified, reagents of analytical grade and distilled water according to TZS 59 shall be used in all the tests.

A.2 For the determination of the sediment, the available chlorine, and the sodium hydroxide contents;

Carry out these determinations on the contents of each of the appropriate containers reserved in accordance with 6.1. Keep the containers closed until the test for available chlorine is to be carried out.

A.3 For the determination of the stability;

Keep the containers closed, store in appropriate containers (see 6.1) in a dark place at a temperature of 20°C to 21°C until the test for compliance with the requirements for stability (see 4.2.4 or 4.3.3, as relevant) are to be carried out.

Annex B
(Normative)

Determination of sediment content

Procedure;

Mix the specimen of sodium hypochlorite solution (see **A.2**) thoroughly and then accurately weigh out approximately 50g into a 100 ml beaker. Filter the solution through a dried and tared sintered crucible with suction. Wash the beaker and the residue five times with 20 ml portions of cold water and dry the residue at 102°C ± 2°C until constant mass is attained. Calculate the sediment content as a percentage of the solution.

Annex C
(Normative)

Determination of available chlorine content

C.1 Summary of method

The sample is added to an acidified solution of potassium iodide and the released iodine is titrated with standard sodium thiosulphate solution to the usual starch end point.

C.2 Reagents

C.2.1 Acetic acid, glacial.

C.2.2 Potassium iodide (KI), crystals, iodate free.

C.2.3 Sodium thiosulphate ($Na_2S_2O_35H_20$), Standard solution (0.1N).

Dissolve 25 g of Na_2SO_3 crystals in freshly boiled and cooled water and dilute to 1 l. The solution is more stable if the glass ware is cleaned with sulphuric-chromic acid and thoroughly rinsed with water. Standardize against potassium iodate (KIO_3) as follows: Weigh out accurately 3.567 g of dry KIO_3 and transfer to a 1 l volumetric flask. Dissolve with water, make up to the mark and mix thoroughly. This solution will be exactly 0.1000 N. To standardize the Na_2SO_3 solution, carefully pipette a 50 ml aliquot of the KIO_3 solution into a 250 ml Erlenmeyer flask and dilute to 100 ml with water. Add 1 g of KI crystals. When it is dissolved, add 15 ml of 1.0 N hydrochloric acid and titrate immediately with the $Na_2S_2O_3$ solution. When the solution becomes light yellow, add 1 ml of starch indicator solution and complete the titration to the disappearance of the blue colour. Standardize at least monthly. Calculate the normality of the $Na_2S_2O_3$ solution as follows:

$$\text{Normality, } N_1 = \frac{(50 \times 0.1)}{A}$$

where,

A is the value of $Na_2S_2O_3$ solution required for titration of KIO_3 solution, ml.

C.2.4 Mix 0.5 g of soluble starch with 5 ml of cold water and add to 95 ml of boiling water. Mix, cool and store in a sterilized bottle. Replace frequently or add 0.1% salicylic acid to minimize deterioration.

C.3 Procedure

Dissolve 2 to 3 g of KI crystals to 50 ml of water in a 250 ml Erlenmeyer flask. Add 10 ml of acetic acid. Then pipette the aliquot of sample into the solution keeping the tip of the pipette beneath the surface of the solution until drained. Titrate at once with 0.1 *N* $Na_2S_2O_3$ solution until the iodine colour is nearly gone then add 1 ml of starch indicator solution and complete the titration to the disappearance of the le colour. Record the titration as A.

C.4 Calculations

C.4.1 Calculate the available chlorine as follows:

$$\text{Available chlorine as CI, g/l} = \frac{(AN_1 \times 35.46)}{V}$$

C.4.2 Calculate the sodium hypochlorite content as follows:

$$\text{Sodium hypochlorite (NaOCI), g/ l} = \frac{(AN_1 \times 37.22)}{V}$$

Where,

A is the volume of $Na_2S_2SO_3$ solution required for titration of the sample, ml;

N_1 is the normality of the $Na_2S_2O_3$ solution; and

V is the volume of original sample in aliquot used, ml.

Annex D
(Normative)

Determination of sodium hydroxide content

D.1 Reagents

a) *Barium chloride solution*

Dissolve 100 g of barium chloride ($BaCl_2.2H_2O$) in water and dilute it to 1 l with water. Filter the solution if turbid.

b) *Hydrogen peroxide solution* -Approximately 3% (10 volumes).

c) *Sodium hydroxide solution* - Approximately 0.4% (m/v) in water.

d) *Screened methyl orange indicator* - an approximately 0.1M solution of hydrochloric acid solution accurately standardized against sodium carbonate using the screened methyl orange as indicator.

D.2 Procedure

Place 50 ml of the barium chloride solution and 40 ml of the hydrogen peroxide solution in a 250-ml conical flask. Add 10 drops of the phenolphthalein indicator and then add the sodium hydroxide solution drop by drop until a permanent faint pink colour is obtained. Immediately pipette 10 ml of the sodium hypochlorite test specimen (see A.2), drop by drop into the flask, taking care that the effervescence does not become excessive. When the effervescence subsides, shake the flask vigorously for 1 min. Add another drop of phenolphthalein indicator and rapidly titrate the solution with the standard 0.1M hydrochloric acid solution until the pink colour first disappears. Do not continue the titration if the pink colour re-appears on standing.

D.3 Calculation

Calculate the sodium hydroxide content as follows:

Sodium hydroxide content, % (m/v) = V x M x 0.4

where

V = volume of hydrochloric acid solution used in the titration in ml
M = Molarity of the hydrochloric acid solution

Annex E
(Normative)

Notes to purchasers

The following requirements must be specified in tender invitations and in each order or contract:

a) the nominal concentration of the sodium hypochlorite solution (see 4.1).

b) when relevant, that the sodium hypochlorite for domestic use shall contain laundry blue (see 4.3).

Annex F
(Informative)

Notes to users

E.1 The decomposition of sodium hypochlorite takes place in two main ways:

a) $3NaOCl \rightarrow 2NaCl + NaClO_3$; and

b) $2NaOCl \rightarrow 2NaCl + O_2$.

Normally, in the dark, over 90 % of the decomposition follows the chlorate-forming mechanism

(see (a)) and the remainder follows the oxygen-forming reaction (see (b)).

E.2 The following are some of the factors that increase the rate at which decomposition of the solution occurs:

a) **concentration**: the rate of decomposition falls off rapidly as the solution loses strength;

b) **temperature**: elevated temperatures greatly increase the rate of decomposition;

c) **metallic impurities**: certain trace metallic impurities such as copper, nickel, cobalt and iron

catalyse the oxygen-forming reaction;

d) **exposure to light**: the rate of both the chlorate-forming reaction and the oxygen-forming reaction is increased by exposure to blue or ultraviolet light; and

e) **pH value of solution**: sodium hypochlorite is stabilized by sodium hydroxide, and the pH value of the solution, should exceed 11.