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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 741

SODIUM CARBONATE FOR INDUSTRIAL USE
DETERMINATION OF SODIUM HYDROGEN CARBONATE
VOLUMETRIC METHOD

1st EDITION

May 1968

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BRIEF HISTORY

The ISO Recommendation R 741, *Sodium carbonate for industrial use – Determination of sodium hydrogen carbonate – Volumetric method*, was drawn up by Technical Committee ISO/TC 47, *Chemistry*, the Secretariat of which is held by the Ente Nazionale Italiano di Unificazione (UNI).

Work on this question by the Technical Committee began in 1951 and led, in 1956, to the adoption of a Draft ISO Recommendation.

In June 1966, this Draft ISO Recommendation (No. 1007) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Argentina	Italy	Switzerland
Austria	Japan	Turkey
Belgium	Korea, Rep. of	U.A.R.
Brazil	Netherlands	United Kingdom
Chile	New Zealand	U.S.S.R.
Czechoslovakia	Poland	Yugoslavia
France	Portugal	
Germany	Romania	
Hungary	South Africa,	
India	Rep. of	
Israel	Spain	

One Member Body opposed the approval of the Draft :

U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in May 1968, to accept it as an ISO RECOMMENDATION.

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SODIUM CARBONATE FOR INDUSTRIAL USE

DETERMINATION OF SODIUM HYDROGEN CARBONATE
VOLUMETRIC METHOD

1. SCOPE

This ISO Recommendation describes a volumetric method for the determination of the sodium hydrogen carbonate content in sodium carbonate for industrial use.

2. PRINCIPLE

Conversion of the sodium hydrogen carbonate contained in the test portion into sodium carbonate by addition of a known excess of sodium hydroxide.

Precipitation of all the carbonate by means of barium chloride.

Determination of the excess of sodium hydroxide by means of a standard volumetric solution of hydrochloric acid using phenolphthalein as indicator. The amount of sodium hydroxide used corresponds to the sodium hydrogen carbonate contained in the test portion.

3. REAGENTS

Distilled water or water of equivalent purity free from carbon dioxide at room temperature should be used in the test.

Eliminate any carbon dioxide present, either by boiling the water for 10 minutes and then cooling in the absence of atmospheric carbon dioxide or, more simply, by bubbling air free from carbon dioxide through the water for 15 minutes. The air is freed from carbon dioxide by passing it over a column containing pellets of sodium hydroxide.

Store the water in the absence of atmospheric carbon dioxide.

3.1 *Barium chloride, dihydrate* ($\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$), 100 g/l solution.

3.2 *Hydrochloric acid*, N standard volumetric solution (see Note, section 6).

3.3 *Sodium hydroxide*, 0.1 N standard volumetric solution (see clause 5.3).

3.4 *Phenolphthalein*, 10 g/l ethanolic solution. Dissolve 1 g of phenolphthalein in 95 % (v/v) ethanol and dilute to 100 ml with the same ethanol.

4. APPARATUS

Ordinary laboratory apparatus.

5. PROCEDURE

5.1 Test portion

Weigh to the nearest 0.01 g, approximately 5 ± 0.1 g of the test sample*.

5.2 Titration

Dissolve the test portion by adding small quantities at a time to a 750 ml conical flask containing approximately 300 ml of water and 50.0 ml of the standard volumetric solution of sodium hydroxide (3.3). Stir during this operation.

After it is completely dissolved, add slowly, while stirring, 170 ml of the barium chloride solution (3.1). Stopper the conical flask with a rubber bung and shake vigorously for 30 seconds.

Allow to stand for 5 minutes, then add four drops of the phenolphthalein solution (3.4) and titrate the excess alkalinity by means of the standard volumetric solution of hydrochloric acid (3.2), adding it drop by drop and stirring constantly until the colour disappears from the solution. If the volume of the standard volumetric solution of hydrochloric acid (3.2) used for the back titration exceeds 1 ml, repeat the determination with a reduced suitable volume of the standard volumetric solution of sodium hydroxide (3.3).

5.3 Blank test

Together with the analysis, and following the same procedure, perform a blank test to determine the actual strength of the standard volumetric solution of sodium hydroxide (3.3) which may be partially carbonated.

For this purpose, determine the volume of the standard volumetric solution of hydrochloric acid (3.2) capable of neutralizing 50.0 ml of sodium hydroxide solution (3.3), operating in the presence of barium chloride (3.1), as previously described but in the absence of the test portion.

Both titrations (5.2 and 5.3) should be carried out under the same operating conditions, avoiding contamination by atmospheric carbon dioxide.

6. EXPRESSION OF RESULTS

Sodium hydrogen carbonate content (NaHCO_3) is given as a percentage by mass by the following formula :

$$(a - b) \times \frac{100}{E} \times A$$

where

a is the volume, in millilitres, of the sodium hydroxide solution (3.3) used in the titration,

t is the true strength of the sodium hydroxide solution (3.3) given by the formula

$$t = \frac{c}{50}$$

where

c is the volume, in millilitres, of the N standard volumetric solution of hydrochloric acid used for the blank test,

b is the volume, in millilitres, of the N standard volumetric solution of hydrochloric acid used for the titration,

E is the mass, in grammes, of the test portion,

A is the mass, in grammes, of sodium hydrogen carbonate corresponding to 1 ml of the N standard volumetric solution of hydrochloric acid, (theoretical value : 1 ml = 0.08402 g of NaHCO_3 ; see Note below).

NOTE. — If the standard volumetric solution of hydrochloric acid (3.2) is not of exactly the strength indicated in the list of reagents, a suitable correction factor should be employed in calculating the results.

* See clause 2.2 of ISO Recommendation R 739, *Sodium carbonate for industrial use — Preparation and storage of test samples*.