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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1687

SODIUM AND POTASSIUM SILICATES FOR INDUSTRIAL USE

DETERMINATION OF DENSITY OF SAMPLES IN SOLUTION

METHOD USING DENSITY HYDROMETER

METHOD USING PYKNOMETER

1st EDITION

July 1970

For each individual country the only valid standard is the national standard of that country.

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BRIEF HISTORY

The ISO Recommendation R 1687, *Sodium and potassium silicates for industrial use – Determination of density of samples in solution – Method using density hydrometer – Method using pyknometer*, 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 led to the adoption of a Draft ISO Recommendation No. 1687 which was circulated to all the ISO Member Bodies for enquiry in December 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	India	Romania
Austria	Iran	South Africa, Rep. of
Belgium	Israel	Spain
Brazil	Italy	Switzerland
Colombia	Japan	Thailand
Czechoslovakia	Netherlands	Turkey
France	New Zealand	U.A.R.
Germany	Peru	United Kingdom
Greece	Poland	U.S.S.R.
Hungary	Portugal	Yugoslavia

No Member Body opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council which decided to accept it as an ISO RECOMMENDATION.

ISO Recommendation | R 1687 | July 1970

SODIUM AND POTASSIUM SILICATES FOR INDUSTRIAL USE

DETERMINATION OF DENSITY OF SAMPLES IN SOLUTION

METHOD USING DENSITY HYDROMETER

METHOD USING PYKNOMETER

1. SCOPE

This ISO Recommendation describes two methods for the determination of the density of solutions of sodium and potassium silicates for industrial use. The two methods described are the method using a density hydrometer and the method using a pyknometer; the latter should be preferred in the case of dispute or high viscosity solutions.

2. METHOD USING DENSITY HYDROMETER

2.1 Principle

Determination at 20 °C by using a hydrometer.

2.2 Apparatus

2.2.1 *Measuring cylinder*, of an effective capacity of 500 ml and an outside diameter of approximately 50 mm.

2.2.2 *Set of density hydrometers*, preferably having the following characteristics :

- Nominal range of individual scales : 0.100 g/ml
- Scale subdivisions : 50 × 0.002 g/ml
- Maximum scale error at the temperature of test : ± 0.002 g/ml
- Overall length : 250 mm
- Length of scale (overall nominal range) : 85 mm
- Bulb diameter : 18 to 20 mm

2.2.3 *Thermometer*, which allows a temperature of 20 °C to be measured to ± 0.5 °C.

2.3 Procedure

Adjust the temperature of approximately 500 ml of test sample to 20 ± 0.5 °C.

Pour the sample into the measuring cylinder (2.2.1), containing the thermometer (2.2.3), and then slowly put in the appropriate hydrometer selected from the set described in clause 2.2.2.

Ensure that the temperature of the liquid is between 19.5 and 20.5 °C and remove the thermometer.

When the hydrometer has reached its equilibrium position, depress it slightly and wait for its return to the equilibrium position, and record the graduation mark.

2.4 Expression of results

The reading of the hydrometer is the density of the sample, expressed in grammes per millilitre.

Record the result to the nearest 0.01 g/ml.

2.5 Accuracy of the method

Experience has shown that the accuracy of this method is within 0.02 g/ml.

3. METHOD USING PYKNOMETER

3.1 Principle

Measurement of the mass, at 20 °C, of the volume of test sample contained in a pyknometer. Determination of this volume by measuring the corresponding mass in water at 20 °C. Calculation of the ratio of the mass of the sample to its volume.

3.2 Apparatus

Ordinary laboratory apparatus and

3.2.1 *Ordinary pyknometer* (see Fig. 1) or a *wide neck pyknometer,* the channel of the stopper not being a capillary tube (see Fig. 2) – Capacity : 50 ml.

3.2.2 *Water bath* controlled at 20 ± 0.5 °C.

3.3 Procedure

Clean and dry the pyknometer (3.2.1) together with its stopper and weigh to the nearest 0.001 g.

Fill the pyknometer with distilled water boiled and cooled to 20 ± 0.5 °C and place it in the water bath (3.2.2) controlled at 20 ± 0.5 °C.

Allow at least 10 minutes for the temperature to reach equilibrium and remove the pyknometer from the water bath, holding it by the neck; stopper it, wipe externally and remove the excess water from the upper part of the stopper.

Weigh the pyknometer and its stopper to the nearest 0.001 g and determine, by difference, the mass of water that it contains.

Empty the pyknometer, rinse it with alcohol or acetone and allow it to dry.

Fill it with the test sample previously adjusted to 20 ± 0.5 °C, avoiding the formation of air bubbles, especially when the solution has a high viscosity.

Place the pyknometer in the water bath (3.2.2) and continue the determination as described above in the third paragraph ("Allow at least 10 minutes for the temperature . . ."), in order to obtain the mass of the sample at 20 °C.

If, during the procedure, the pyknometer is externally soiled by the solution under test, it must be washed with water at a temperature slightly below 20 °C and then wiped.

3.4 Expression of results

The density, at 20 °C, of the sample, is given by the following formula :

$$\frac{m_0}{m_1} \times \rho$$

where

m_0 is the mass, in grammes, of the sample;

m_1 is the mass, in grammes, of the same volume of water;

ρ is the density of water, at 20 °C (= 0.9982 g/ml).

Give the result to the nearest 0.001 g/ml.

NOTE. – The formula $\frac{m_0}{m_1} \times \rho$ may also be written $\frac{m_0}{V}$, where V is the volume at 20 °C of the pyknometer, expressed in millilitres $(= \frac{m_1}{\rho})$.

If several determinations are carried out, it is easier not to determine V (i.e. m_1) for each measurement but simply to check its constancy from time to time.

3.5 Accuracy of the method

Experience has shown that the accuracy of the method is 0.002 g/ml.

4. TEST REPORT

Give the following particulars :

(*a*) the reference of the method used;
(*b*) results and the method of expression used;
(*c*) any unusual features noted during the determination;
(*d*) any operations not included in this ISO Recommendation, or regarded as optional.