INTERNATIONAL STANDARD 1687

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Sodium and potassium silicates for industrial use — Determination of density at 20 °C of products in solution — Method using density hydrometer and method using pyknometer

Silicates de sodium et de potassium à usage industriel — Détermination de la masse volumique à 20 °C des produits en solution — Méthodes à l'aréomètre à masse volumique et au pycnomètre

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Descriptors : sodium silicates, potassium silicates, tests, dissolved matter, density measurement, density (mass/volume), areometric analysis, pyknometric analysis.

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 47 has reviewed ISO Recommendation R 1687 and found it technically suitable for transformation. International Standard ISO 1687 therefore replaces ISO Recommendation R 1687-1970 to which it is technically identical.

ISO Recommendation R 1687 was approved by the Member Bodies of the following countries :

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

No Member Body expressed disapproval of the Recommendation.

No Member Body disapproved the transformation of ISO/R 1687 into an International Standard.

Printed in Switzerland

Sodium and potassium silicates for industrial use — Determination of density at 20 °C of products in solution — Method using density hydrometer and method using pyknometer

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies two methods for the determination of the density at 20 °C of sodium and potassium silicates for industrial use. The two methods specified are the method using a density hydrometer and the method using a pyknometer; the latter is to be preferred in the case of dispute or of high viscosity solutions.

2 REFERENCE

ISO 1686, *Sodium and potassium silicates for industrial use — Samples and methods of test — General.*

3 METHOD USING DENSITY HYDROMETER

3.1 Principle

Determination of the density at 20 °C of a test sample by using a hydrometer.

3.2 Apparatus

3.2.1 Measuring cylinders, having an effective capacity of 500 ml and an outside diameter of approximately 50 mm.

3.2.2 Set of density hydrometers, preferably having the following characteristics :

- nominal range of individual scales : 0,100 g/ml;
- scale subdivisions : 50 X 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.

3.2.3 Thermometer, which allows a temperature of 20 °C to be measured to ± 0,5 °C.

3.3 Procedure

Adjust the temperature of approximately 500 ml of the test sample (see ISO 1686) to 20 ± 0,5 °C.

Pour this sample into the measuring cylinder (3.2.1), containing the thermometer (3.2.3), and then slowly insert the appropriate hydrometer selected from the set described in 3.2.2.

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, wait for its return to the equilibrium position, and record the graduation mark.

3.4 Expression of results

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

Express the result to the nearest 0,01 g/ml.

3.5 Accuracy of the method

Experience has shown that the accuracy of this method is within 0,02 g/ml.

4 METHOD USING PYKNOMETER

4.1 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 of water at 20 °C. Calculation of the ratio of the mass of the sample to its volume.

4.2 Apparatus

Ordinary laboratory apparatus and

4.2.1 Ordinary pyknometer (see figure 1), or **wide-neck pyknometer,** (see figure 2) the channel of the stopper not being a capillary tube, of capacity 50 ml.

4.2.2 Water bath, capable of being controlled at 20 ± 0,5 °C.

4.3 Procedure

Clean and dry the pyknometer (4.2.1) together with its stopper and weigh the stoppered pyknometer 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 (4.2.2) controlled at 20 ± 0,5 °C.

Allow at least 10 min 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 filled, stoppered pyknometer 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 (see ISO 1686) 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 (4.2.2) and continue the determination as specified from the third to the fifth paragraph, 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.

4.4 Expression of results

The density, at 20 °C, expressed in grams per millilitre, is given by the formula :

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

where

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

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

ρ is the density, in grams per millilitre, of water, at 20 °C (= 0,998 2 g/ml).

Express 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, in millilitres, at 20 °C of the pyknometer $(= \frac{m_1}{\rho})$.

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.

4.5 Accuracy of the method

Experience has shown that the accuracy of the method is 0,002 g/ml.

5 TEST REPORT

The test report shall include the following particulars :

a) the reference of the method used;

b) the results and the method of expression used;

c) any unusual features noted during the determination;

d) any operations not included in this International Standard or the International Standard to which reference is made, or regarded as optional.

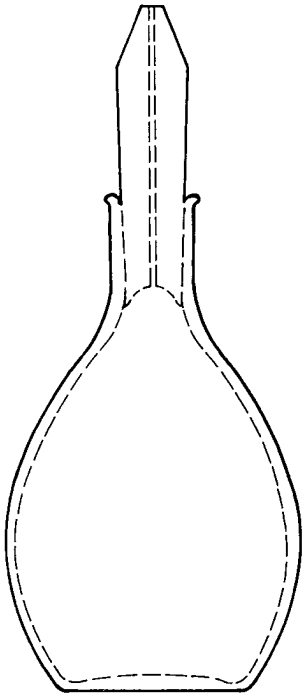

FIGURE 1 – **Ordinary pyknometer**

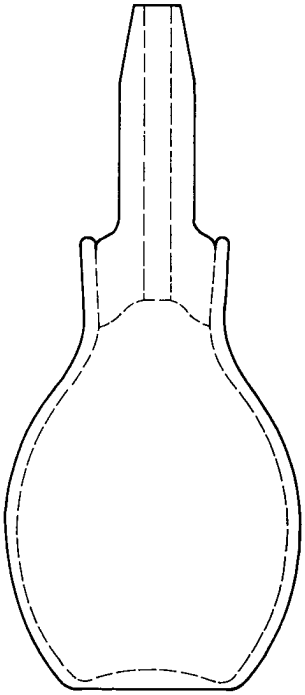

FIGURE 2 – **Wide-neck pyknometer**

ANNEX

ISO PUBLICATIONS RELATING TO SODIUM AND POTASSIUM SILICATES FOR INDUSTRIAL USE

ISO 1686 – Samples and methods of test – General.

ISO 1687 – Determination of density at 20 °C of products in solution – Method using hydrometer and method using pyknometer.

ISO 1688 – Determination of dry matter – Gravimetric method.

ISO 1689 – Calculation of the ratio $\frac{SiO_2}{Na_2O}$ or $\frac{SiO_2}{K_2O}$.

ISO 1690 – Determination of silica content – Gravimetric method by insolubilization.

ISO 1691 – Determination of carbonate content – Gas-volumetric method.

ISO 1692 – Determination of total alkalinity – Titrimetric method.

ISO 2122 – Preparation of solution of products not easily soluble in boiling water and determination of matter insoluble in water.

ISO 2123 – Determination of dynamic viscosity.

ISO 2124 – Determination of silica content – Titrimetric method.

ISO 3200 – Determination of sulphate content – Barium sulphate gravimetric method.

ISO 3201 – Determination of iron content – 1,10-Phenanthroline photometric method.