INTERNATIONAL STANDARD

ISO 705

Second edition
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Rubber latex — Determination of density between 5 °C and 40 °C

Latex de caoutchouc — Détermination de la masse volumique entre 5 °C *et* 40 °C

Reference number
ISO 705:1994(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 705 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 3, *Raw materials (including latex) for use in the rubber industry*.

This second edition cancels and replaces the first edition (ISO 705:1974), which has been technically revised.

In the present edition of this standard, the temperature correction calculation has been specified in accordance with current practice. The scope has been broadened to include synthetic and prevulcanised natural rubber latices.

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Rubber latex — Determination of density between 5 °C and 40 °C

1 Scope

This International Standard specifies a method for the determination of the density of natural rubber latex concentrate between the temperatures of 5 °C and 40 °C. The standard is intended for use when density determinations are used to calculate the mass of a measured volume of latex in locations where it is not practical to weigh directly or to control the temperature of the laboratory. For such purposes, it is essential that the density be determined on a latex sample containing the same amount of air as it contained when the volume was measured. Therefore, the latex bulk is allowed to stand for a minimum period of 24 h before sampling to ensure the removal of air bubbles. The density determination is preferably made at the same temperature as the volume measurement, otherwise a correction must be applied.

This method is suitable for all latices from natural sources, for synthetic latex and for compounded or prevulcanized latex, as well as for artificial dispersions of rubber; however, the temperature correction given in 7.2 is not necessarily valid for all these.

For measurements made at standard temperatures, ISO 8962:1987, *Plastics — Polymer dispersions — Determination of density* should be used.

NOTE 1 It is intended that future editions of ISO 8962 will be modified to include latex in the scope.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 123:1985, *Rubber latex — Sampling.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 density: Mass divided by volume at a stated temperature.

Density is expressed in megagrams per cubic metre $\left(Mg/m^3\right)$.

3.2 natural rubber latex concentrate: Natural rubber latex containing ammonia and/or other preservatives and which has been subjected to some form of concentration.

4 Apparatus

4.1 Density bottle (pyknometer), capacity 50 cm^3, having a ground-glass stopper through which a capillary tube passes, and fitted with a ground-glass cap (see figure 1).

4.2 Constant-temperature bath, accurate to within ± 0,2 °C and adjustable to a temperature above or below ambient temperature. If a constant-temperature bath is not available, a water bath shall be used to ensure that the latex is at a known temperature.

4.3 Balance, accurate to 1 mg.

4.4 Two conical flasks, of at least 200 cm^3 capacity, each fitted with a rubber stopper holding a short glass inlet tube with a blowing ball at the external end and a glass tube at the inside end reaching nearly to the bottom of the flask.

5 Sampling

The latex to be sampled shall have stood for at least 24 h to ensure the removal of air bubbles. Record the temperature θ of the bulk of the latex at the time of sampling. Carry out the sampling in accordance with one of the methods specified in ISO 123, taking care to avoid entrapment of air and ensuring that the bottle in which the sample is placed is completely filled.

6 Procedure

Carry out the determination as soon as possible after sampling. If an adjustable constant-temperature bath (4.2) is not available, proceed in accordance with 6.2. The procedure takes account of the difficulties of controlling the temperature at the point of sampling natural rubber latex concentrate and the consequent need for a temperature correction.

6.1 Adjust the temperature of the constant-temperature bath to θ (see clause 5). Stir the sample of the latex gently without introducing any air bubbles. Partly fill one of the conical flasks (4.4) with a suitable volume of latex and place in the bath. Likewise, partly fill the second conical flask with cool, freshly boiled, distilled water and place in the bath.

Weigh the clean and dry density bottle (4.1) with its stopper and cap to the nearest 1 mg. Immerse the density bottle up to its neck in the bath, with the ground-glass stopper in place but not the cap. Allow the density bottle and the two conical flasks containing the latex and the water to come to the temperature of the bath — this will require a minimum of 20 min.

Using the blowing ball, such a few cubic centimetres of latex from the conical flask containing the latex and discard, then transfer sufficient into the density bottle to fill it completely. Put the stopper in place and immediately wipe clean the top surface (tissue paper is recommended for this purpose), taking care not to remove any latex from the capillary tube. Remove the bottle from the bath and immediately put in place the ground-glass cap. Dry the outside of the density bottle with the minimum of handling and then weigh the bottle to the nearest 1 mg.

Empty the bottle and wash free from latex with distilled water. Immerse the bottle up to its neck in the constant-temperature bath as before. Fill the density bottle with distilled water, transferring it by blowing from the second conical flask. Allow it to stand for 5 min in the bath. Empty the bottle, put it back in the bath and refill by the same procedure. Immediately insert the stopper and wipe dry the top surface (tissue paper is recommended for this purpose), taking care not to remove any water from the capillary tube. Remove the density bottle from the bath and immediately put in place the ground-glass cap. Dry the outside of the bottle with the minimum of handling and then weigh the bottle to the nearest 1 mg.

6.2 If a non-adjustable water bath is used, the temperature of the bath shall be such that it is not likely to fluctuate during the course of the determination and it shall be as close as is practical to the temperature θ of the bulk latex (see clause 5).

Record the temperature θ_1 of the bath.

Proceed as described in 6.1. Recheck the temperature of the bath before filling the density bottle with latex and after filling it with water. If the temperature of the bath has altered by > 1 °C, repeat the procedure.

7 Expression of results

7.1 Calculate the density ρ of the latex at the temperature of the bath, in megagrams per cubic metre, using the equation

$$\rho = \frac{m_L \times \rho_W}{m_W}$$

where

m_L is the mass, in grams, of the latex in the density bottle;

m_W is the mass, in grams, of the water in the density bottle;

ρ_W is the density, in megagrams per cubic metre, of water at the bath temperature as given in table 1.

The results of duplicate determinations shall agree to within 0,001 Mg/m^3.

Table 1 — Density of water at various temperatures

Temperature °C	Density Mg/m³
5	1,000 0
6	0,999 9
7	0,999 9
8	0,999 8
9	0,999 8
10	0,999 7
11	0,999 6
12	0,999 5
13	0,999 4
14	0,999 2
15	0,999 1
16	0,998 9
17	0,998 8
18	0,998 6
19	0,998 4
20	0,998 2
21	0,998 0
22	0,997 8
23	0,997 5
24	0,997 3
25	0,997 0
26	0,996 8
27	0,996 5
28	0,996 2
29	0,995 9
30	0,995 6
31	0,995 3
32	0,995 0
33	0,994 7
34	0,994 4
35	0,994 0
36	0,993 7
37	0,993 3
38	0,993 0
39	0,992 6
40	0,992 2

7.2 In the case of natural rubber latex concentrate of 55 % to 75 % total solids content, when the temperature of the density determination θ_1 (see 6.2) differs from that of the bulk latex, the corrected density shall be calculated using the following equation (correct over the range 5 °C to 40 °C):

$$\rho_c = \rho_1 [1 - 0{,}0005 (\theta - \theta_1)]$$

where

ρ_c is the corrected density at temperature θ;

ρ_1 is the density determined at temperature θ_1.

8 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) all details necessary for the identification of the sample;

c) the results and the units in which they have been expressed;

d) the temperatures of the bulk latex and the bath;

e) any unusual features noted during the determination;

f) the date of the test;

g) any operation not included in the International Standard or regarded as optional.

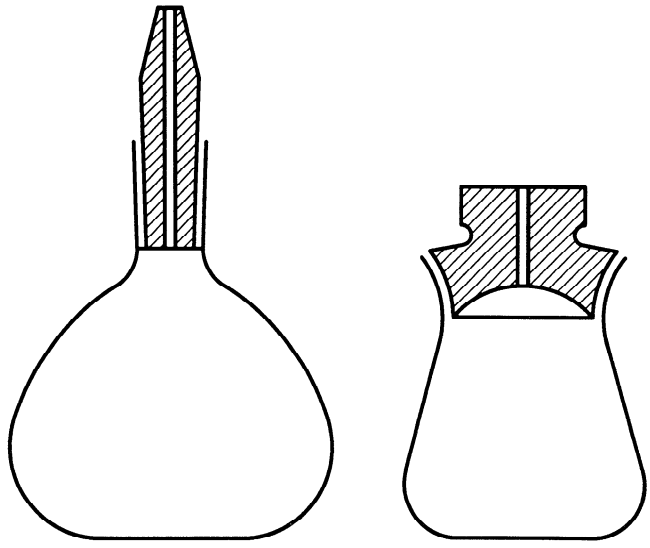

Figure 1 — Density bottles (pyknometers)

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Descriptors: rubber, natural rubber, latex, tests, determination, density (mass/volume).

Price based on 3 pages