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International Standard 1409

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Rubber latex — Determination of surface tension

Latex de caoutchouc — Détermination de la tension superficielle

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (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 authorized 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.

International Standard ISO 1409 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*.

This third edition was submitted directly to the ISO Council, in accordance with clause 6.11.2 of part 1 of the Directives for the technical work of ISO. It cancels and replaces the second edition (i.e. ISO 1409-1982), which had been approved by the member bodies of the following countries:

Australia	Hungary	Spain
Austria	India	Sri Lanka
Brazil	Iran	Sweden
Canada	Israel	Switzerland
Chile	Italy	Turkey
Czechoslovakia	Netherlands	United Kingdom
Egypt, Arab Rep. of	New Zealand	USA
France	Peru	USSR
Germany, F.R.	Poland	Yugoslavia
Greece	South Africa, Rep. of	

No member body had expressed disapproval of the document.

The second edition, which superseded ISO 1409-1974, incorporated draft Amendment 1, which was circulated to the member bodies in July 1981 and had been approved by the member bodies of the following countries:

Austria	Hungary	South Africa, Rep. of
Belgium	India	Spain
Brazil	Indonesia	Sweden
Canada	Korea, Rep. of	Thailand
China	Netherlands	Turkey
Czechoslovakia	New Zealand	United Kingdom
Egypt, Arab Rep. of	Poland	USA
France	Portugal	USSR
Germany, F.R.	Romania	

No member body had expressed disapproval of the document.

Rubber latex — Determination of surface tension

1 Scope and field of application

This International Standard specifies a method for the determination of the surface tension of synthetic or natural rubber latices. The surface tension of the latex is determined at a total solids content of 40 % or less.

2 References

ISO 123, *Rubber latex — Sampling.*[1]

ISO 124, *Rubber latices — Determination of total solids content.*

3 Apparatus

3.1 Leconte du Nouy tensiometer, with platinum ring of either 60 mm or 40 mm nominal circumference.

3.2 Glass dish, of 50 cm^3 capacity[2] with internal diameter of at least 45 mm.

4 Sampling

Carry out the sampling in accordance with one of the methods specified in ISO 123.

5 Procedure

Clean the dish carefully, since any contamination may produce variable results. Clean the tensiometer ring by washing in water and then heating in the oxidizing section of a Bunsen flame. Take extreme care to avoid distortion when handling the tensiometer ring.

Carefully calibrate the tensiometer scale against a standard mass in accordance with the manufacturer's instructions, so that the scale will read in millinewtons per metre.

If the total solids content of the latex is not known, determine it in accordance with ISO 124. If necessary, dilute the latex to a total solids content of 40 ± 1 % with distilled water or water of equivalent purity. Strain approximately 25 cm^3 of the latex, adjusted to a temperature[3] of 23 ± 1 °C or 27 ± 1 °C for

1) At present at the stage of draft. (Revision of ISO 123-1974.)

2) The term millilitre (ml) is commonly used as a special name for the cubic centimetre (cm^3), in accordance with a decision of the 12th Conférence Générale des Poids et Mesures. The term millilitre is acceptable, in general, for references in International Standards to capacities of volumetric glassware and to liquid volumes. Glassware with either marking is satisfactory for use with the procedure described in this International Standard.

3) The temperature coefficient of surface tension of rubber latices over the temperature range 20 to 30 °C is −0,1 mN/m per °C.

tropical countries, into the dish. Remove any skin or air bubbles on the surface of the latex by wiping with a piece of filter paper, and measure the surface tension immediately to avoid errors due to the formation of surface skin.

With the tensiometer protected from air currents, place the dish containing the latex beneath the ring on the adjustable platform of the instrument. Adjust the instrument so that the beam is in its balance position when the ring is dry and the scale reading is zero, then raise the platform until the latex makes contact with the ring. Immerse the ring beneath the surface of the latex. Slowly lower the platform by means of the platform adjusting screw and, simultaneously, increase the torsion of the wire, proportioning these two adjustments so that the beam remains exactly in its balance position. As the film adhering to the ring approaches the breaking point, proceed more slowly with the adjustments to make certain that the system is in its balance position when rupture occurs. Record the calibrated scale reading at which the ring detaches from the latex. Clean the ring as before and repeat the determination.

Discount the first reading and record the average of the next three readings, which should agree within 0,5 mN/m.

6 Expression of results

The surface tension, σ, expressed in millinewtons per metre, is given by the equation

$$\sigma = M \times F$$

where

M is the calibrated scale reading of the tensiometer;

F is a factor calculated according to the equation

$$F = 0{,}725\,0 + \sqrt{\frac{0{,}036\,78 \times M}{\bar{r}^2} + P}$$

where

$\bar{r}$ is the mean radius, in millimetres, of the ring;

P is a constant calculated according to the equation

$$P = 0{,}045\,34 - \frac{1{,}679 \times r_w}{\bar{r}}$$

r_w being the radius, in millimetres, of the wire of the ring.

NOTE — Surface tension and surface free energy are synonymous and have equal numerical values when expressed in millinewtons per metre and millijoules per metre squared respectively.

7 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 test sample;

c) the results and the method of expression used;

d) any unusual features noted during the determination;

e) any operation not included in this International Standard, or regarded as optional.