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Plastics/rubber — Polymer dispersions and rubber latices (natural and synthetic) — Definitions and review of test methods

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*Plastiques/caoutchouc — Dispersions de polymères et de latex de
caoutchouc (naturel et synthétique) — Définitions et revue des méthodes
d'essai* [ISO 12000:1996](#)

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Reference number
ISO 12000:1996(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.

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International Standard ISO 12000 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*, in close collaboration with ISO/TC 45, *Rubber and rubber products*.

It represents a first step towards the aim of harmonizing parallel standards in the two technical committees mentioned above.

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Plastics/rubber — Polymer dispersions and rubber latices (natural and synthetic) — Definitions and review of test methods

1 Scope

This International Standard gives definitions relative to polymer dispersions and latices and identifies the test methods applicable for determining the properties of aqueous and non-aqueous polymer dispersions, comprising products of synthetic or natural origin including synthetic and natural rubber latices. Some of the test methods apply only to polymer dispersions or latices of specific chemical composition or to those to be used for specific applications.

NOTE 1 Where they are not the subject of an existing International Standard, the test methods to be used for investigation of an individual polymer dispersion or latex will have to be the subject of agreement between the interested parties.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were 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 editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 35:1995, *Latex rubber, natural, concentrate — Determination of mechanical stability.*

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

ISO 124:—¹⁾, *Latex, rubber — Determination of total solids content.*

ISO 125:1990, *Natural rubber latex concentrate — Determination of alkalinity.*

ISO 126:1995, *Latex, rubber, natural concentrate — Determination of dry rubber content.*

ISO 127:1995, *Rubber, natural latex concentrate — Determination of KOH number.*

ISO 291:—²⁾, *Plastics — Standard atmospheres for conditioning and testing.*

1) To be published. (Revision of ISO 124:1992)

2) To be published. (Revision of ISO 291:1977)

- ISO 471:1995, *Rubber — Temperatures, humidities and times for conditioning and testing.*
- ISO 472:1988, *Plastics — Vocabulary.*
- ISO 506:1992, *Rubber latex, natural, concentrate — Determination of volatile fatty acid number.*
- ISO 705:1994, *Rubber latex — Determination of density between 5 °C and 40 °C.*
- ISO 706:1985, *Rubber latex — Determination of coagulum content (sieve residue).*
- ISO 976:1996, *Rubber and plastics — Polymer dispersions and rubber latices — Determination of pH.*
- ISO 1147:1995, *Plastics/rubber — Polymer dispersions and synthetic rubber latices — Freeze-thaw cycle stability test.*
- ISO 1409:1995, *Plastics/rubber — Polymer dispersions and rubber latices (natural and synthetic) — Determination of surface tension by the ring method.*
- ISO 1625:—³⁾, *Plastics — Polymer dispersions — Determination of non-volatile matter (residue) at specified temperatures.*
- ISO 1652:1985, *Rubber latex — Determination of viscosity.*
- ISO 1656:1996, *Rubber, raw natural, and rubber latex, natural — Determination of nitrogen content.*
- ISO 1657:1986, *Rubber, raw and rubber latex — Determination of iron content — 1,10-Phenanthroline photometric method.*
- ISO 1802:1992, *Natural rubber latex concentrate — Determination of boric acid content.*
- ISO 2005:1992, *Rubber latex, natural, concentrate — Determination of sludge content.*
- ISO 2006:1985, *Rubber latex, synthetic — Determination of high-speed mechanical stability.*
- ISO 2008:1987, *Rubber latex, styrene-butadiene — Determination of volatile unsaturates.*
- ISO 2115:1996, *Plastics/rubber — Polymer dispersions and rubber latices — Determination of white point temperature and minimum film-forming temperature.*
- ISO 2555:1989, *Plastics — Resins in the liquid state or as emulsions or dispersions — Determination of apparent viscosity by the Brookfield Test method.*
- ISO 3136:1983, *Rubber latex — Styrene-butadiene — Determination of bound styrene content.*
- ISO 3219:1993, *Plastics — Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscometer with defined shear rate.*
- ISO 3499:1976, *Plastics — Aqueous dispersions of homopolymers and copolymers of vinyl acetate — Determination of bromine number.*
- ISO 3899:1988, *Rubber — Nitrile latex — Determination of residual acrylonitrile content.*
- ISO 3900:1995, *Rubber — Nitrile latex — Determination of bound acrylonitrile content.*
- ISO 4576:1996, *Plastics — Polymer dispersions — Determination of sieve residue (gross particle and coagulum content).*

3) To be published. (Revision of ISO 1625:1977)

ISO 4655:1985, *Rubber — Reinforced styrene-butadiene latex — Determination of total bound styrene content.*

ISO 7780:—⁴⁾, *Rubbers and rubber latices — Determination of manganese content — Sodium periodate photometric methods.*

ISO 8053:1995, *Rubber and latex — Determination of copper content — Photometric method.*

ISO 8962:1987, *Plastics — Polymer dispersions — Determination of density.*

NOTE 2 Where individual standards overlap, it is intended that they will be harmonized by the Technical Committees responsible for them, ISO/TC 45 and ISO/TC 61.

3 Definitions

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

3.1 dispersion: A heterogeneous system in which a finely divided material is distributed in another material (definition taken from ISO 472).

3.2 polymer dispersion (dispersion of natural or synthetic homopolymer and copolymer): A liquid to semi-liquid material, usually milky-white, containing the polymeric material in a stable condition finely dispersed in a continuous liquid phase, normally water (aqueous dispersion) or an organic liquid (non-aqueous dispersion or NAD).

3.3 latex: The traditional designation for a colloidal aqueous dispersion of natural or synthetic rubber polymer. Frequently, "latex" is also used as a synonym for polymer dispersions in general.

NOTE 3 Polymer dispersions and latices are often further explained by adding the designation of the base polymer by name or by abbreviation, for instance polyacrylate dispersion, SBR latex

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4 Sampling

Sampling shall be carried out in accordance with ISO 123 (rubber latex).

Representative samples of aqueous and non-aqueous polymer dispersions and of latices are a prerequisite for reliable and reproducible results from the test methods. Therefore the material to be tested must be uniform.

5 Conditioning

The conditioning and testing atmosphere shall comply with the specified test method or referring standard, as applicable. If there are no such requirements, then samples shall be conditioned and tests carried out in one of the standard atmospheres specified in either ISO 291 for polymer dispersions or ISO 471 for latices, as appropriate.

6 Test methods

Test methods shall be selected from those given in table 1 for rubber latices, and those in table 2 for polymer dispersions, as appropriate.

⁴⁾ To be published. (Revision of ISO 7780:1987)

Table 1 — Test methods developed by ISO/TC 45

Property	Units	Test method	Comments
Physical and physico-chemical properties			
Mechanical stability	s	ISO 35	Natural rubber latex only
Total solids content	% (m/m)	ISO 124	
Alkalinity	g/100 g of latex	ISO 125	Natural rubber latex only
Dry rubber content	% (m/m)	ISO 126	Natural rubber latex only
Density	Mg/m ³	ISO 705	Natural rubber latex only
Coagulum content (sieve residue)	% (m/m)	ISO 706	
pH	pH-units	ISO 976	
Surface tension	mN/m	ISO 1409	
Viscosity	mPa·s	ISO 1652	Apparent viscosity
Sludge content	% (m/m)	ISO 2005	Natural rubber latex only
High-speed mechanical stability	% (m/m)	ISO 2006	Synthetic rubber latex only
Volatile unsaturates	% (m/m)	ISO 2008	Styrene-butadiene latex
Chemical properties			
KOH number		ISO 127	Natural rubber latex only
Volatile fatty acid number		ISO 506	Natural rubber latex only
Nitrogen content	% (m/m)	ISO 1656	Natural rubber latex only
Iron content (1,10-phenanthroline photometric method)	ppm (m/m)	ISO 1657	
Boric acid content	% (m/m)	ISO 1802	Natural rubber latex only
Bound styrene content	% (m/m)	ISO 3136	Styrene-butadiene latex
Residual acrylonitrile content	% (m/m)	ISO 3899	Nitrile latex
Bound acrylonitrile content	% (m/m)	ISO 3900	Nitrile latex
Total bound styrene content	% (m/m)	ISO 4655	Reinforced styrene-butadiene latex
Manganese content (sodium periodate photometric method)	mg/kg	ISO 7780	
Copper content (photometric method)	mg/kg	ISO 8053	

Table 2 — Test methods developed by ISO/TC 61

Property	Units	Test method	Comments
Physical and physico-chemical properties			
pH	pH-units	ISO 1148	
Residue at 105 °C	% (m/m)	ISO 1625	
Apparent viscosity by Brookfield method (general procedure)	Pa·s	ISO 2555	
Viscosity using rotational viscometer at defined shear rate	Pa·s	ISO 3219	
Gross particle content by sieve analysis	% (m/m)	ISO 4576	Residue on sieve(s) substantially larger than average particle size
Density	g/cm ³	ISO 8962	Using pycnometer or hydrometer, depending on precision required
Chemical properties			
Bromine number	g/100 g	ISO 3499	Measures residual unsaturation — directly applicable only to poly(vinyl acetate) dispersions
General			
Freeze-thaw cycle stability	number of cycles	ISO 1147	} Generally, applicable only to polymer dispersions
White point temperature and minimum film-forming temperature	°C	ISO 2115	

7 Precision of the test methods used

Details of the precision of the test method used shall be given in a "Precision" clause. If the experimental data on which the stated precision is based are included in the standard, this may be placed in an informative annex. The precision shall be expressed as a percentage of the results in terms of the following:

- a) repeatability;
- b) reproducibility.

8 Test report

The results of the individual tests performed on a polymer dispersion/latex shall be recorded in a test report. This shall comply with the requirements of the particular International Standard in question, but shall include at least the following information:

- a) a reference to the International Standard used for the test;
- b) all details necessary to identify completely the product and sample tested;
- c) the results of the test and the conditions of testing;
- d) any deviations from the procedure specified;
- e) any unusual incident noted during the test;
- f) the date and place of the test.

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