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ISO RECOMMENDATION

R 462

iTeh STANDARD PREVIEW

PLASTICS

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RECOMMENDED PRACTICE FOR THE DETERMINATION OF CHANGE OF MECHANICAL PROPERTIES AFTER CONTACT WITH CHEMICAL SUBSTANCES

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BRIEF HISTORY

The ISO Recommendation R 462, *Recommended Practice for the Determination of Change of Mechanical Properties after Contact with Chemical Substances*, was drawn up by Technical Committee ISO/TC 61, *Plastics*, the Secretariat of which is held by the American Standards Association, Inc. (ASA).

Work on this question by the Technical Committee began in 1959 and led, in 1961, to the adoption of a Draft ISO Recommendation.

In June 1962, this Draft ISO Recommendation (No. 511) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Australia	Germany	Romania
Austria	Hungary	Spain
Belgium	India	Sweden
Chile	Italy	Switzerland
Colombia	Japan	U.S.A.
Czechoslovakia	Mexico	U.S.S.R.
Denmark	New Zealand	Yugoslavia
Finland	Poland	
France	Republic of South Africa	

One Member Body opposed the approval of the Draft:

United Kingdom.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1965, to accept it as an ISO RECOMMENDATION.

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PLASTICS

**RECOMMENDED PRACTICE FOR THE DETERMINATION
OF CHANGE OF MECHANICAL PROPERTIES
AFTER CONTACT WITH CHEMICAL SUBSTANCES**

1. SCOPE

This ISO Recommendation describes the procedure for measuring the change in the mechanical properties of plastics after immersion in chemical substances. This method is intended for the testing of all organic plastic materials, such as cast, extruded, calendered, moulded, laminated products, both flexible and rigid, sheet, rod and tube materials.

2. SIGNIFICANCE OF TEST

- 2.1 This method is only suitable for the comparison of the behaviour of different plastics after immersion in chemical substances, in liquid form or in solution.
- 2.2 This comparison is carried out by measuring certain mechanical properties of the material before and after immersion in chemical substances.
- 2.3 The choice of the mechanical properties to be measured is determined according to the type of material and its foreseen applications.
- 2.4 The choice of reagents, temperature and duration of test is necessarily arbitrary; the list of reagents reported in section 6 serves primarily as a guide to investigators wishing to compare the relative resistance to chemicals of different plastics and to have a first assessment of their behaviour in respect to certain groups of chemical substances.

3. APPARATUS

The apparatus consists of the following:

- (a) *Containers*: suitable jars or beakers; the dimensions should be proportionate to the test specimens; one container is provided for each test specimen.
- (b) *Thermostatic enclosures*, suitable for maintaining the containers with the chemical reagents and the specimens at the test temperature (see clause 7.5).
- (c) *Apparatus* for the determination of the mechanical properties to be measured; they should correspond to those described in the different ISO Recommendations referring to the mechanical property under consideration.

4. TEST SPECIMENS

The test specimens should be identical with those required in the specific ISO Recommendation referring to the mechanical property under consideration.

5. CONDITIONING TEST SPECIMENS

The test specimens should be conditioned according to ISO Recommendation R 291, *Plastics — Standard Atmospheres for Conditioning and Testing*.

6. REAGENTS

The same reagents should be used as those described in section 7 of ISO Recommendation R 175, *Plastics—Determination of the Resistance of Plastics to Chemical Substances*.

7. PROCEDURE

7.1 For each of the selected reagents and temperatures, the number of test specimens required for mechanical test in accordance with the applicable ISO Recommendation are prepared. In addition, a sufficient number of test specimens for blank tests are prepared and, if the effects of extraction of plasticizers or other soluble components are to be determined (see clause 7.10), duplicate test specimens are prepared for this purpose.

7.2 If necessary, the dimensions of the test specimens are measured, as required by the applicable ISO Recommendation.

7.3 Each test specimen, after conditioning, is placed in a separate container and totally immersed in the reagent. It is placed in such a position that it is completely surrounded by the liquid which is already at the specified temperature.

The amount of reagents used is proportionate to the container and to the test specimen, as specified in ISO Recommendation R 175, clause 6.3.

7.4 The container then is covered and kept at the test temperature for the specified time.

7.5 The immersion test is carried out at two different temperatures, i.e.

(1) (a) at one of the ISO standard test temperatures:

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 $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

(b) at $70\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ or

(2) at any other temperature agreed upon between buyer and seller.

7.6 The standard duration of test is 7 days. For thin films and sheets, however, a shorter duration (3 days are recommended) is suggested. This time should be stated in the specification for the material to be tested and should be reported with the test results in the test report.

NOTE.—In certain cases, however, when the normal exposure time of 7 days does not cause a measurable change of the mechanical properties, a longer immersion time, for instance a multiple of 7 days, should be chosen.

7.7 The test liquids are stirred, for instance by slow rotation of the containers, at least every 24 hours for the first 7 days and at least once a week thereafter. Highly viscous test liquids or emulsions are continuously stirred, if necessary.

- 7.8 The test specimens are removed from the liquids and quickly rinsed with tap water or other suitable solvent, wiped with a dry cloth or absorbent tissue or paper, and tested without delay for the chosen mechanical properties according to the corresponding ISO Recommendations. The test temperature is that of the ISO standard conditioning and/or test atmosphere. * When the test is carried out at a higher temperature than that of the standard conditioning and/or test atmosphere,* the test specimens are allowed to cool in the container, before being removed from the liquids. For this purpose, the container is removed from the thermostatic enclosure and cooled to the test temperature by any suitable means within 1 hour.
- 7.9 A blank test is carried out on a group of unexposed test specimens prepared from the same sample of plastics.
- 7.10 In many cases, for instance, where it is required to determine the effects of the extraction of plasticizers or other soluble components by volatile solvents, the effect of the loss of such components on the mechanical properties may be balanced by the absorption of the reagent itself.

In such cases, it is recommended that two sets of test specimens be exposed to the selected reagent, after which two determinations of the mechanical properties should be made as follows:

- (a) on wet test specimens, according to the procedure described in clause 7.8 above;
- (b) on dried test specimens reconditioned to the standard conditioning and/or test atmosphere.* Drying and reconditioning should be sufficient for the complete evaporation of the test solvent or reagent and for the re-establishment, in the test specimens, of the initial humidity conditions.

However, temperature and duration of drying should be specified for each individual case.

8. TEST REPORT

The report should include the following:

- (a) complete identification of the material tested, including type and dimensions of test specimens, and method of preparation thereof;
- (b) mechanical properties taken into consideration and test methods;
- (c) identification of the reagents employed in the test;
- (d) temperature and duration of tests;
- (e) statement of the complementary treatment of the test specimens after immersion, if any;
- (f) values of the mechanical properties obtained on the single test specimens:
- in the blank test,
 - after treatment with a given reagent,
 - if necessary, after treatment with the same reagent and subsequent drying;

* See Report of Co-ordination Committee on Atmospheric Conditioning for Testing (ATCO), 6/7 May 1957.

(g) Average values of each group of test specimens obtained:

- in the blank test,
- after treatment with a given reagent,
- if necessary, after treatment with the same reagent and subsequent drying;

(h) Change in the value of any mechanical property P , expressed as a percentage of gain or loss, arising from the comparison of the treated and blank specimens, and calculated as follows

$$\Delta P \text{ percent} = \frac{P_2 - P_1}{P_1} \times 100$$

where P_2 = average value of the property determined on treated test specimens,

P_1 = average value of the property determined on test specimens in blank test;

(i) In the case of the treatment described under clause 7.10, change of mechanical properties after drying should be calculated as follows

$$\Delta P_d \text{ percent} = \frac{P_3 - P_1}{P_1} \times 100$$

where P_3 = average value of the property determined on the treated specimens after drying and reconditioning;

(j) Any observation of change of surface character or appearance of test specimens and of any change in appearance of the reagent;

(k) When a sufficient number of successive determinations has been made, the change of mechanical properties may be plotted, in a graph, versus time.

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