INTERNATIONAL STANDARD 1110

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Plastics — Polyamide 66, 610 and 6 — Accelerated conditioning of test specimens

Matières plastiques — Polyamides 66, 610 et 6 — Conditionnement accéléré d'éprouvettes

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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 61 has reviewed ISO Recommendation R 1110 and found it technically suitable for transformation. International Standard ISO 1110 therefore replaces ISO Recommendation R 1110-1969 to which it is technically identical.

ISO Recommendation R 1110 was approved by the Member Bodies of the following countries :

Austria	Hungary	Poland
Belgium	India	Romania
Bulgaria	Iran	South Africa, Rep. of
Czechoslovakia	Israel	Spain
Egypt, Arab Rep. of	Japan	Sweden
France	Korea, Dem. P. Rep. of	Switzerland
Germany	Korea, Rep. of	Turkey
Greece	Netherlands	U.S.A.

The Member Bodies of the following countries expressed disapproval of the Recommendation on technical grounds :

Canada
Italy
United Kingdom

The Member Bodies of the following countries disapproved the transformation of ISO/R 1110 into an International Standard :

Canada
United Kingdom

Printed in Switzerland

Plastics — Polyamide 66, 610 and 6 — Accelerated conditioning of test specimens

0 INTRODUCTION

Relative humidity has a remarkable influence on various characteristics of polyamides, and these characteristics can often only be defined as a function of the moisture content.

At room temperature, the speed of water absorption of polyamide test specimens is very low, in particular at heavy sections. A test specimen of 1 mm thickness, from polyamide 66, for instance, would need about 30 days for obtaining its equilibrium moisture content at a relative humidity of 65 % and a temperature of 20 °C. Therefore, it is necessary to use an accelerated conditioning treatment if tests are to be made on equilibrated materials.

The method described in this International Standard is based on the use of aqueous solutions of potassium acetate in various concentrations, depending on the polyamide type and on the relative humidity. Increased temperatures are applied to accelerate the conditioning treatment.

The present method can be used to obtain, in an accelerated way, a conditioning equal to the conditioning by storage during a long period of time in ambient air, either at a relative humidity of 50 % and a temperature of 23 °C, or a relative humidity of 65 % at a temperature of 20 or 27 °C (see ISO/R 291, *Plastics — Standard atmospheres for conditioning and testing*).

The values of the mechanical properties obtained by conditioning according to this method may not be the same as those which are obtained by storing the specimens at room temperature during a long period, because of recrystallization phenomena.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for the accelerated conditioning of test specimens of polyamide 66, 610 and 6.

The method is only intended for polyamide types 66, 610 and 6 provided that no fillers, plasticizers, stabilizers, additives, etc. migrate into the aqueous solution of potassium acetate. The method is not valid for polyamide 6 containing more than 2 % extractable matter.

The method can be used to condition specimens for the determinations of mechanical or thermal properties, but since residual salt may affect the result, it is not recommended for specimens to be used for the measurement of electrical properties.

2 PRINCIPLE

Test specimens are kept in an aqueous solution of potassium acetate at a high temperature (about 100 °C) for a specified period. The concentration of the potassium acetate in the solution depends on the type of polyamide and on the specified relative humidity. The time required for the conditioning depends mainly on the thickness of the test specimens and on the type of polyamides.

Because of possible degradation due to hydrolysis and oxidation, the thickness of the test specimen should not exceed 4 mm and the conditioning temperature should not exceed 100 °C. Under these conditions deterioration will normally be negligible.

3 REAGENTS

3.1 Potassium acetate, anhydrous, analytically pure.

3.2 Distilled water.

4 APPARATUS

4.1 Round-bottomed flask, with ground glass stopper, with sufficient capacity to contain the test specimens and the potassium acetate solution.

A reflux cooler is mounted on top of the flask to keep the concentration of the solution constant.

4.2 Boiling-water vessel or **thermostatically controlled bath.**

5 PROCEDURE

5.1 Preparation of the required potassium acetate solution

The concentration (c) of potassium acetate in water (g/100 ml) and the relative density (d) of the solution at 20 °C are shown in table 1 for each polyamide type, for the two relative humidities (65 % and 50 %).

TABLE 1

Relative humidity	Polyamide 66		Polyamide 610		Polyamide 6	
	c	d^{20}_{20}	c	d^{20}_{20}	c	d^{20}_{20}
%	g/100 ml		g/100 ml		g/100 ml	
65	80	1 240	100	1,277	60	1,200
50	100	1,277	140	1,329	70	1,220

5.2 Conditioning treatment

Add a sufficent amount of the potassium acetate solution to the flask. The volume of fluid shall be such that its concentration remains practically unaffected by the water absorption of the test specimens. As a rule, the test specimen to bath ratio (by volume) should be below 1/20.

Heat the flask and its contents to between 95 and 100 °C and keep the temperature at this level.

Immerse the test specimens in the bath. To allow a uniform absorption, the test specimens shall be completely immersed and separated from one another.

Follow the water absorption by successive weighing of different test specimens. Rinse the test specimens quickly with distilled water, dry the surface and leave them to cool in standard atmosphere for 30 min every time they are taken from the bath.

Equilibrium will be assumed when the results of two successive weighings differ by less than 0,1 %. A possible loss of extractable products should be allowed for in the case of polyamide 6.

As a general indication, table 2 shows the times required for this conditioning, if made at 95 to 100 °C, depending on the thickness of the test specimen (based on originally dry specimens).

TABLE 2

Polyamide	Conditioning time		
	Test specimen thickness		
	1 mm	3 mm	4 mm
Polyamide 66	7 h	4 days	7 days
" 610	7 h	4 days	6 days
" 6 (with a low extractable content)	6 h	3 days	5 days

When equilibrium is almost reached, the time interval between successive weighings should be about one-tenth of the complete time required for conditioning.

Until the moment of the mechanical test, the conditioned test specimens shall be kept in the chosen standard atmosphere.

6 REPORT

The report shall include the following particulars :

a) identification of the test specimens;

b) the concentration of the solution of potassium acetate;

c) the temperature and time of the treatment;

d) the moisture content obtained;

e) the date.

This report shall be included in the corresponding test report.