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Plastics — Reinforced moulding compounds and preregs — Determination of apparent volatile-matter content

*Plastiques renforcés — Compositions pour moulage et préimprégnés —
Détermination de la teneur apparente en matières volatiles*



Reference number
ISO 9782:1993(E)

Foreword

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International Standard ISO 9782 was prepared by Technical Committee ISO/TC 61, *Plastics*, Sub-Committee SC 13, *Composites and reinforcement fibres*.

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International Organization for Standardization

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Plastics — Reinforced moulding compounds and prepregs — Determination of apparent volatile-matter content

1 Scope

This International Standard specifies a method for the determination of the apparent volatile-matter content in pre-impregnated yarns, tapes, mats (SMC) and fabrics.

The method is applicable to all unidirectional and multidirectional fibre-reinforced prepregs and all thermosetting-resin matrices, unless otherwise specified in product specifications.

If aramid fibres are used as the reinforcement, water absorbed by the fibres is eliminated with volatile matter at the test temperature. It is therefore necessary to correct the volatile-matter content by subtracting the water content.

The method does not apply to unimpregnated reinforcement fibres.

NOTE 1 For products with a polyester-resin matrix (UP), the result will be lower than the real value.

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 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

3 Principle

The apparent volatile-matter content is the percentage of matter lost on heating, relative to the initial mass. It is obtained by measuring the change in mass of a test specimen when heated in an air-ventilated oven at a specified temperature for a specified length of time.

4 Apparatus

4.1 Cutting device, for preparation of test specimens.

4.2 Balance, accurate to 1 mg.

4.3 Air-ventilated oven, capable of being maintained at the chosen temperature to within $\pm 5^\circ\text{C}$.

4.4 Desiccator.

4.5 Suitable specimen holders, such as boats, hooks or aluminium sheets.

5 Sampling

Sampling shall be carried out in accordance with the appropriate material specification.

6 Sample conditioning and test atmosphere

6.1 Sample conditioning

A sufficient quantity of the sample to give the required number of specimens for testing (see 7.2) shall be conditioned for a time sufficient to establish temperature equilibrium in the standard atmosphere chosen for testing (see 6.2) without removing the

protective sheet(s), and in a waterproof bag if necessary.

6.2 Test atmosphere

The test shall be carried out in one of the standard atmospheres specified in ISO 291.

7 Test specimens

7.1 Shape and dimensions

The surface area of each test specimen shall be at least 100 cm² or the mass of the test specimen shall be at least 1 g. The test specimen may be circular or square, or may have any other shape suitable for testing.

7.2 Preparation and number of test specimens

Three test specimens shall be taken from each sample. These specimens shall be taken from locations distributed uniformly across the full width of the laboratory sample. If the sheet width is less than 30 cm, the specimens shall be taken from locations staggered along the length of the sheet. The test specimens shall be taken at least 5 cm from the edges.

8 Procedure

8.1 Cut out the test specimens using a suitable cutting device (4.1) or take a suitable quantity of pre-impregnated yarn.

8.2 Weigh each specimen, with any protective sheets it may have, as quickly as possible after cutting it out, and record the mass m_1 in grams.

8.3 Remove the protective sheets, if present, and weigh them. Record their mass m_2 in grams.

8.4 Place each test specimen on a pre-weighed aluminium sheet or in a pre-weighed boat, or hang it from a pre-weighed hook (see 4.5), and insert specimen plus support into an oven (4.3) which has been pre-heated to the temperature specified in the specification for the material concerned. Recommended temperatures and heating times for use in cases when no temperature or time is specified are given in table 1.

Table 1 — Recommended oven temperatures

Resin	Temperature °C	Heating time min ± 1 min
Epoxy	160	15
Phenolic	160	15
Polyester	125	60
Silicone	160	15
Polyimide	160	15

8.5 After heating for the required length of time, remove the specimens from the oven. Avoid resin loss due to dripping while in the oven. Let the specimens cool in a desiccator (4.4).

8.6 Determine the specimen mass m_3 immediately after removal from the desiccator, either by direct weighing if the specimen can be removed from the holder without loss of material, or by subtracting the mass of the holder from the combined mass of holder and specimen.

9 Expression of results

Calculate the apparent volatile-matter content, expressed as a percentage by mass, of each test specimen, using the following formula:

$$\frac{m_1 - m_2 - m_3}{m_1 - m_2} \times 100$$

where

m_1 is the mass, in grams, of the test specimen together with its protective sheets (see 8.2);

m_2 is the mass, in grams, of the protective sheets if the test specimen has any (see 8.3);

m_3 is the mass, in grams, of the test specimen after heating in the oven (see 8.6).

Report as the result the arithmetic mean of the three determinations.

10 Precision

The precision of this test method is not known because inter-laboratory data are not available. Inter-laboratory data are being obtained, and a precision statement will be added at the next revision.

11 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all information necessary for complete identification of the material tested;
- c) the mean value of the apparent volatile-matter content and, if required, the result of each individual determination;
- d) the test conditions used;
- e) the date of the test;
- f) any deviation from the procedure specified.

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