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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 27797.4-2013

**Fibre-reinforced plastics - Methods of producing test plates -
Part 4: Moulding of prepregs**

纤维增强塑料 试验板制备方法 第4部分：预浸料模塑

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1 Scope

This part of GB/T 27797 lays down the methods for moulding test plates of multi-layer unidirectional fibre prepreg or of fabric prepreg by applying heat and pressure with different equipment, such as a heated press, a pneumatic press, a hydraulic press and vacuum-bag pressing equipment. It applies to all reinforcement materials and resins.

The method applies to thermosetting resin prepregs and to thermoplastic resin prepregs. When the test plate is prepared, the prepreg is laid in the required order and direction, pressed and cured under heat and pressure or under vacuum; the test plate produced is suited to being machined into specimens.

Standard plates made in this way may be used to analyse their constituents, that is the reinforcement material, the additives and the resin, and also to judge the overall quality of the final product.

2 Normative references

The documents listed below cannot be dispensed with for the application of this document. For dated references only the edition corresponding to that date applies; for undated references the latest edition, including any amendments, applies.

ISO 291 Plastics - Standard atmospheres for conditioning and testing.

ISO 1172 Textile-glass-reinforced plastics - Prepregs, moulding compounds and laminates - Determination of the textile-glass and mineral filler content - Calcination methods.

ISO 1183 (all parts) Plastics - Methods for determining the density of non-cellular plastics.

ISO 1268-1 Fibre-reinforced plastics - Methods of producing test plates - Part 1: General

conditions.

ISO 2818 Plastics - Preparation of test specimens by machining.

ISO 7822 Textile glass reinforced plastics - Determination of void content - Loss on ignition, mechanical disintegration and statistical counting methods.

3 Health and safety

See ISO 1268-1.

4 Principle

The fibre-reinforced prepreg is cut to the required number of layers and dimensions and laid in the required order and direction, so as to prepare a standard plate for machining specimens. The prepreg is preliminarily consolidated and the air is driven out by mechanical compression or by drawing a vacuum. The prepreg stack is normally sealed in a vacuum bag and is finally cured, following the instructions of the material supplier, under a combination of heat and pressure produced by mechanical equipment. Suitable process routes include the use of an autoclave, a pressure vessel, a vacuum generator or a hydraulic press.

Unless the surface effects of the specimen are being studied, the surface of the test plate is to be flat and is to meet the dimensions needed to cut the largest specimen.

5 Equipment

5.1.1 Process equipment - press: of any model, provided with the components specified in 5.1.1.1 to 5.1.1.4.

5.1.1.1 Frame (see Figure 1), made up of the framework, the press head and the base. The framework is to be high enough to give the moulding space needed to place the mould containing the prepreg stack. The clearance between the press head and the framework is to be at least 0.2 mm, so that guide rods can be fitted.

5.1.1.2 Side-opening mould (see Figure 2), made up of two flat metal plates, a bottom plate and a cover plate, with adjustable spacer blocks fitted at the four corners to control the thickness of the test plate; the dimensions of the mould plates are to allow the test plate to be machined into the specimens required. The flatness of the mould surface in contact with the test plate is to lie within ± 0.05 mm, for which polishing or hard chromium plates are used. The thickness of steel mould plates is 5 mm and that of aluminium alloy mould plates is 6 mm. Note 1: test plates of a particular thickness may be obtained by placing spacer blocks of suitable size at the four corners of the two mould plates. Note 2: an arrow may be engraved on the bottom plate to identify the zero-degree direction of the test plate; care is to be taken that the arrow engraved on each test plate does not affect the properties of that

plate. Non-square test plates may also be made, for example 350 mm by 300 mm, with the long side parallel to the zero-degree direction.

5.1.1.3 Pressurizing method: the pressure is applied following the specified force-time curve, and the accuracy of the pressure control over the whole pressurizing process is 5 %.

5.1.1.4 Temperature measuring and control equipment: able to give a rate of temperature rise of at least 3 °C/min and to reach the curing temperature needed within a given range, or able to meet the requirements of a temperature-time curve.

5.1.2 Autoclave: of any dry-heat type, complying with 5.1.1.3 and 5.1.1.4.

5.1.3 Forced-air oven, complying with 5.1.1.4.

5.1.4 Rule: measures the length and the width of the test plate, accurate to 0.5 mm.

5.1.5 Micrometer: measures the thickness of the test plate, accurate to 0.01 mm.

5.1.6 Balance: weighs to 0.01 g.

5.1.7 Cutting equipment, such as a sharp-edged knife.

5.1.8 Vacuum pump: able to produce a vacuum of 0.08 MPa or lower.

5.1.9 Compressed air device: able to reach a pressure of 0.7 MPa +/- 0.014 MPa.

5.2.1 Auxiliary equipment and materials - rubber sealing gasket: of suitable shape and size, placed around the test plate, able to withstand a temperature 20 °C higher than the curing temperature.

5.2.2 Release film: able to withstand a temperature 20 °C higher than the curing temperature, made of polyvinyl fluoride (PVF), of polytetrafluoroethylene (PTFE) or of fabric coated with polytetrafluoroethylene.

5.2.3 Perforated release film: able to withstand a temperature 20 °C higher than the curing temperature, made of the same materials.

5.2.4 Sealing film: able to withstand a temperature 20 °C higher than the curing temperature, made of the same materials.

5.2.5 Breather material, such as aluminium wire mesh or glass-fibre fabric.

5.2.6 Bleeder material, which absorbs the surplus resin, such as woven glass-fibre fabric. Note: a woven glass-fibre fabric with a mass per unit area of 100 to 300 grams per square metre absorbs about 60 to 115 grams of resin per square metre, while a polyamide fibre fabric with a mass per unit area of 60 grams per square metre absorbs about 40 grams of resin per square metre.

5.2.7 Metal edge-pressing strip: 15 mm wide and of suitable length, laid in the mould around the test plate; its thickness depends on the thickness of the test plate being

prepared.

5.2.8 Sealing tape: able to withstand a temperature 20 °C higher than the curing temperature.

6 Procedure

6.1 The materials used to prepare the test plate, the prepreg included, have their state adjusted for at least 2 h in one of the standard atmospheres specified by ISO 291, and the subsequent lay-up is carried out in the same atmosphere (see 6.4).

6.2 If the raw material has been stored at a temperature lower than the conditioning temperature, it is to be placed in a sealed bag, so that it takes up no moisture until it has reached the conditioning temperature.

6.3 Unless otherwise specified, thermosetting materials are to be cured within 6 h after their state has been adjusted.

6.4 From the conditioned prepreg the required number of layers is cut, so as to obtain a test plate of the specified length, width and thickness; the direction of each layer of the lay-up is given in the specification or in the test method, see Annex A. The cut prepreps are laid in the specified order on the lower mould plate. A thermocouple is inserted at the edge of the prepreg stack to control the temperature during the moulding. The distribution of the prepreg stack and of the auxiliary materials in the autoclave is shown in Figure 3, which gives a test plate with a flat surface. If the appearance of the product is to be studied, a further perforated release film suited to that study is placed on the top layer. Figure 4 gives the arrangement of the stack and of the auxiliary materials suited to air pressure.

Note 1: the quantity of bleeder material used to absorb the surplus resin is determined by the resin content of the test plate; the thickness and the resin content of the test plate also vary with the pressure, the temperature and other factors, that is with the properties of the fibre and resin system used, see Note 2.

Note 2: at a given pressure, preliminary trials may be needed to establish the number of prepreg layers and the quantity of bleeder material required to obtain a test plate of specified thickness and fibre content. For low-bleed systems, the number of prepreg layers needed can be calculated from the thickness of each layer.

Relationship to other documents

The foreword states that GB/T 27797, Fibre-reinforced plastics - Methods of producing test plates, is divided into eleven parts, and that this text is Part 4.

The part is a translation-identical adoption of ISO 1268-4:2005, with the editorial change of turning some wording suited to an international standard into wording suited to a national standard. The foreword records the corresponding national documents for the international