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

GB/T 42542-2023

**Fibre-reinforced composites - Method for accelerated moisture
absorption and supersaturated conditioning by moisture using
sealed pressure vessel**

纤维增强复合材料 密封压力容器加速吸湿及过饱和状态调节方法

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Foreword

This document was issued on 23 May 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 December 2023.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 42542-2023 covers the accelerated moisture conditioning of fibre-reinforced composites inside a sealed pressure vessel - the principle of holding a laminate above 100 °C under saturated water vapour pressure so that it reaches in a short time a water content that would otherwise build up only slowly; the instruments and equipment, from the vessel and its temperature control to the balance the specimens are weighed on; the test procedures, which start by conditioning the specimens for 24 h at 23 °C and 50 percent relative humidity, weigh them, and then follow the mass uptake to a saturated or supersaturated state; the precision of the figures obtained; and the test report. Appendix A works through carbon fibre thermoset and thermoplastic specimens carried to supersaturation. Absorbed water plasticises the matrix and weakens the fibre-matrix interface, so hot-wet property data is what qualification actually rests on, yet waiting for real absorption at room temperature is impractical and an unregulated hot soak scatters: two

laboratories then report different saturated baselines for the same material and their strength results cannot be set side by side. Written for composite test laboratories, aerospace, rail and automotive material qualification groups, and suppliers who have to present durability evidence.

This document specifies the method for accelerated moisture absorption and supersaturated

conditioning by moisture of fiber-reinforced composites using sealed pressure vessels at a heating temperature above 100 °C and saturated water vapor pressure conditions.

The purpose of this moisture absorption method is to screen materials by mechanical or thermal

properties.

This document is applicable to fiber-reinforced composites with a glass transition temperature

(T_g) greater than 150 °C, including carbon fiber-reinforced thermoset composites (CFRP), carbon fiber-reinforced thermoplastic composites (CFRTP) and glass fiber-reinforced composites, etc.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only

versions with a specified date are applicable to this document. In terms of references without a

specified date, the latest version (including all the modifications) is applicable to this document.

ISO 472 Plastics - Vocabulary

NOTE: GB/T 2035-2008 Terms and Definitions for Plastics (ISO 472:1999, IDT)

3 Terms and Definitions

What is defined in ISO 472, and the following terms and definitions are applicable to this document.

Addresses of the terminology databased maintain by ISO and IEC for standardization are as

follows:

---ISO online browsing platform: <http://www.iso.org/obp>;

---IEC electronic open platform: <http://www.electropedia.org/>.

3.1 additional moisture content

Additional moisture content refers to the additional moisture absorption mass of the test material as a percentage of the initial test material mass.

NOTE: see Formula (1).

3.2 initial moisture content

Initial moisture content refers to the moisture absorption mass percentage of the test material at

the beginning of the moisture absorption test.

NOTE: see Formula (3).

3.3 supersaturated conditioning by moisture

Supersaturated conditioning by moisture refers to the conditioning process, in which, the test

material is cooled from a moisture absorption saturated state of relatively high temperature and

humidity (for example, a relatively high temperature and saturated water vapor pressure) to room temperature.

3.4 accelerated moisture absorption

In order to obtain the saturated moisture content (3.5) in a shorter time, moisture absorption is

performed under specific conditions of a relatively high temperature (for example, 120 °C) and

moisture absorption pressure (for example, 0.2 MPa).

3.5 saturated moisture content

Saturated moisture content refers to the moisture absorption rate obtained when the test material

is cooled from a relatively high temperature (for example, 120 °C) to a relatively low temperature (room temperature) under supersaturated conditioning by moisture.

4 Principle

In order to facilitate the test material to obtain a moisture absorption saturated state that is almost similar to that at room temperature in a short period of time, the test material is placed

under the conditions of a relatively high temperature and humidity [for example, temperature

120 °C and saturated water vapor pressure with air (oxygen) 0.2 MPa] for moisture absorption.

The higher the temperature, the faster the diffusion rate of water molecules inside the material;

the higher the water vapor pressure, the higher the frequency of the material surface absorbing

water molecules from the outside. Therefore, the moisture absorption saturated (or balanced)

state of the material can be obtained in a relatively short period of time. However, if this moisture absorption saturated material is cooled to room temperature, due to the slow diffusion

rate of water molecules inside the material and the slow-release rate on the material surface, the

material will be in a supersaturated state by moisture absorption.

Through this mode, the supersaturated state by moisture absorption of thermoset and

During heating from room temperature to 120 °C, the exhaust system can discharge the air inside the autoclave when the temperature reaches 100 °C.

NOTE: autoclave is known as "high-pressure sterilizer" in the biological and medical industries.

This high-pressure sterilizer differs from the stainless-steel sealed pressure vessel (5.2) in the chemical industry.

5.6 Vacuum Oven

The vacuum oven can be heated to 200 °C under reduced pressure, with a temperature control

accuracy of ± 1 °C.