NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 9914.1-2013

Test method for reinforcement products - Part 1: Determination of moisture content

增强制品试验方法 第1部分：含水率的测定

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1 Scope

GB/T 9914.1-2013 determines the moisture content of reinforcement fibres. In composites, water on the fibre is not a minor contaminant but the direct cause of the most common defect: it interferes with the sizing that couples fibre to resin, it prevents proper wet-out, and during cure it becomes steam, leaving voids at the interface where the load is meant to transfer. The consequence is a laminate that meets its fibre content specification and falls short of its mechanical properties, with no visible cause. Glass fibre in particular picks up moisture readily from humid air during storage, which makes this a receiving and pre-processing check rather than a one-off characterisation. This part of GB/T 9914 specifies the method for determining the moisture content of glass fibre, carbon fibre and aramid fibre products. It applies to continuous filament yarn, fixed-length yarn, untwisted roving, chopped strand and the other reinforcement product forms within its scope. It is written for fibre producers, for the composite manufacturers who inspect incoming material, and for the laboratories that arbitrate when a laminate fails to perform.

This Part of GB/T 9914 specifies the method for determining the moisture content of glass fiber, carbon fiber, aramid fiber products. This method is applicable to continuous fiber yarn, fixed-length fiber yarn, untwisted roving, chopped strands, felt, fabric and other forms of reinforcement products.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

ISO 291 Plastics - Standard atmospheres for conditioning and testing

3 Definitions

The following definitions apply to this document.

3.1 Moisture content The moisture of the product measured by a specified method, which is expressed as a percentage of the wet mass of the product.

4 Principle

The specimen is dried at 105 °C; the mass of the specimen before and after drying is weighed at standard room temperature.

5 Instruments

5.1 Ventilated oven: Air replacement rate 20 times/h ~ 50 times/h, temperature can be controlled at 105 °C ± 3 °C or selected temperature ±3 °C (see Chapter 4).

5.2 Dryer: Filled with suitable desiccant, such as silica gel, calcium chloride or phosphorus pentoxide.

5.3 Specimen dish: Made of heat-resistant material, which can maximize air circulation on the specimen surface and prevent specimen loss, such as ceramic crucible or stainless steel mesh basket.

Note: If there is no mass loss when the specimen is transferred from the specimen dish to the oven, several specimens can be placed in one specimen dish.

5.4 Stainless steel clamps: Used to clamp the specimen and the specimen dish.

5.5 Balance: Accurate to

0.1 mg.

5.6 Polished metal template and suitable cutting tools: Such as knife, scissors or disc knife (for woven fabrics and felt). Both of these can be replaced by punching devices.

5.7 Weighing bottle with stopper: Used for weighing aramid fiber yarn or weighing specimens with an estimated moisture content exceeding 0.2% (such as specimens taken from the center of the package or wet chopped strands).

6.1 Sampling

6.1.1 General Unless otherwise required by the product specification or the test client, sampling shall be carried out as follows:

6.1.2 Continuous fiber yarn, staple yarn, roving The sampling method selected shall be able to detect the moisture content of the surface layer of the package. Remove the outer layer of the package and take a certain length of yarn as a specimen. The mass of each specimen is at least 5 g, preferably between 15 g and 30 g. If the moisture content of the yarn tends to increase toward the center of the package, the product specification or the test client may specify that one or more specimens be taken from one or more locations of the package for testing. When selecting the specimen at the center, the outer yarn shall be cut carefully to avoid damaging the specimen. The specimens shall be weighed as quickly as possible. To this end, the unit product or laboratory sample in a standard environment specified in ISO 291 at a temperature of 23 °C ± 2 °C and a relative humidity of (50 ± 10)%, for a sufficient time to fully reach equilibrium, which is usually at least 6 hours. When the moisture content of the product is estimated to be higher than 0.2%, the unit product or laboratory sample shall be stored in a sealed container and tested immediately after sampling. The sample can be placed in a container and placed at the standard temperature before the test; however, it shall be sealed to prevent moisture loss. In addition, whenever possible, the sample shall be remixed in the container and tested immediately to avoid erroneous measurement results due to moisture migration in the material.

8 Operation

8.1 General This chapter describes the process of weighing the specimen in the specimen dish. When the specimen is weighed separately, proceed directly according to 8.3; however, the sample shall be carefully clamped out of the specimen dish or put back with tongs. During the entire test process, ensure that the sample is placed in a fixed and identifiable specimen dish without confusion.

8.2 Weighing the specimen dish Place the specimen dish (5.3) in a ventilated oven (5.1) to maintain a constant mass. The temperature of the ventilated oven is controlled within the range of 105 °C ± 3 °C. If it is known that the specimen contains substances that are volatile at 105 °C, a lower temperature may be selected, but not less than 50 °C. Hold the specimen dish with clamps (5.4). Place the specimen dish in a desiccator (5.2) and cool it to the standard temperature of 23 °C ± 2 °C specified in ISO 291. Weigh its mass, accurate to

0.1 mg; record it as m0; the unit is gram (g).

8.3 Initial (before drying) mass Place the specimen immediately in the specimen dish. Weigh the mass of the specimen and the specimen dish, accurate to

0.1 mg; record it as m1; the unit is gram (g).