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

GB/T 14853.6-2013

Replacing GB/T 14853.6-2002

**Rubber compounding ingredients - Pelletized carbon black -
Part 6: Determination of individual pellet crushing strength**

橡胶用造粒炭黑 第6部分：单个颗粒破碎强度的测定

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1 Scope

This part of GB/T 14853 specifies the test methods, method A and method B, for the individual pellet crushing strength of pelletized carbon black for rubber.

The part applies to the determination of the individual pellet crushing strength of all types of pelletized carbon black for rubber.

2 Normative references

The listed documents are indispensable for the application of the document. For dated references only the edition cited applies; for undated references the latest edition, including all amendments, applies.

The references given are: GB 3778 Carbon black for rubber; GB/T 6003.1 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth (GB/T 6003.1-2012, ISO 3310-1:2000, MOD); and GB/T 14853.5 Rubber compounding ingredients - Pelletized carbon black - Part 5: Determination of pellet size distribution (GB/T 14853.5-2013, ISO 8511:2011, MOD).

3.1 Individual pellet crushing strength

Individual pellet crushing strength is defined as the force required to crush one carbon black pellet under specified conditions.

4 Outline of the method

Test sieves are used to separate out the fraction of pellets of the specified size. One pellet at a time is selected and placed between two platens that can apply force, and the force applied when the pellet crushes is recorded.

5 Sampling

Sampling is carried out in accordance with GB 3778.

6 Selection of the test pellets

A sufficient quantity of carbon black is separated with a sample divider so as to obtain a representative sample of about 100 g.

The sieve stack is assembled from bottom to top as follows: the bottom receiver pan, the 200 mm by 25 mm test sieve with a 1.4 mm aperture, and the 200 mm by 25 mm test sieve with a 1.7 mm aperture.

The test portion is transferred into the 200 mm by 25 mm test sieve with a 1.7 mm aperture, the sieve lid is fitted, and the stack is placed in the sieve shaker. Shaking is carried out at the lowest power setting for 60 seconds, with a tolerance from zero to plus 10 seconds, so as to avoid crushing the pellets.

The sieve stack is taken off the shaker and the pellets that come closest to spherical are selected from the carbon black retained on the 200 mm by 25 mm test sieve with a 1.4 mm aperture. A note explains that these near-spherical pellets may be picked out with a special tray: about 2 g of pellets are poured onto the wide end of the selection tray and the tray is tilted slightly so that the near-spherical pellets roll to the narrow end, where they are collected for testing.

Twenty pellets are normally used for the test. Where a more precise value is required and the customer and the supplying manufacturer agree, 50 or 100 pellets may be tested; where necessary the number of pellets used is agreed between customer and supplier.

The acceptable pellet diameter ranges given below are those established by excluding the lowest values caused by instrument fluctuation and by non-spherical pellets. They are the 1.4 mm to 1.7 mm fraction and the 1.0 mm to 1.18 mm fraction.

7.1 Method A - Outline of the test method

The carbon black test portion is passed through two sieves to separate out the fraction of pellets of the same pellet size, the pellets closest to spherical are selected from that fraction and placed in the test instrument. A platen fitted with a force transducer presses on the individual pellet to measure the force. The pressure applied to the pellet may cause the pellet to crush, accompanied by a sudden drop in stress, or the pellet may merely be flattened. Of the force value at which the maximum stress at crushing falls by 3 cN and the maximum force required to flatten the pellet to 90 % of its original size, whichever occurs first is taken as the individual pellet crushing strength.

7.2 Method A - Apparatus

An automatic pellet strength tester with a force measuring accuracy of ± 2 cN and a diameter measuring accuracy of ± 0.1 mm, or a relative force measuring accuracy of ± 0.5 cN and a relative diameter measuring accuracy of ± 0.02 mm. It is to include the following important components and features.

The carbon black pellet is placed automatically on a movable platen, the pellet being moved so that it touches the second platen with the smallest possible force; normally one flat plate carries the force measuring device, and the force at which contact is detected is not to exceed 2 cN. The instrument is to be able to apply pressure at a constant rate; to convey pellets so that pellet displacement when pressure is applied is minimal; and to measure the diameter of an individual pellet along the axis in which force is applied.

A control device is required, to make the equipment carry out the whole test cycle: crushing the pellet under controlled conditions, measuring and storing the initial diameter and the crushing force result, cleaning the debris from the platen surface and preparing for the next test.

An arithmetic discrimination system is required to determine the end point of a single test; it compares the force value at which the pellet diameter has decreased to a specified value with the force value at which the maximum force measured at crushing has fallen by a specified force, and takes as the end-point force the maximum force corresponding to whichever of these two conditions occurs first.

A procedure for calculating the specified pellet values required by item g) of clause 11 is required, together with a computer able to identify, check and print the data and to store it.

A mechanical sieve shaker meeting the requirements of the test method of GB/T 14853.5.

Test sieves of 200 mm by 25 mm with a 1.4 mm aperture and of 200 mm by 25 mm with a 1.7 mm aperture, complying with GB/T 6003.1, used to separate the carbon black and able to separate out the 1.4 mm to 1.7 mm fraction of pellets for testing. For carbon blacks of which very little is retained on the 1.4 mm test sieve, such as acetylene black and thermal black, test sieves of 200 mm by 25 mm with a 1.18 mm aperture and of 200 mm by 25 mm with a 1.0 mm aperture may be used. A note states that the default test pellet size in the instrument program is the 1.4 mm to 1.7 mm pellet fraction, and that other pellet sizes can be set through the menu of the instrument computer software.

A bottom receiver pan and a sieve lid; a sample divider; and a special sphere selection tray, a shallow trough-shaped box, flat and about 300 mm long.

7.3 Method A - Calibration

Pressure and diameter measurement are calibrated in accordance with the manufacturer's instructions.

The tester parameters are given as follows. Crushing diameter, 0.90 mm: reduction of the pellet diameter to 90 % of the initial diameter is one of the two end-point criteria. Falling force: a fall of 3 cN from the maximum force observed is the other end-point criterion. Plunger travel rate during crushing, 0.125 mm/s.

7.4 Method A - Test procedure

The test is carried out following the instructions in the operating manual of the instrument.

8.1 Method B - Apparatus

A manual pellet strength tester able to apply force at a constant rate and to measure the force at which the pellet crushes. The equipment is to have the following characteristics: two parallel platens, a base plate and a force-applying metal plate, that remain horizontal throughout the test; the ability to apply force at a constant rate of 5 cN/s to 25 cN/s; a force measurement accuracy of 1 cN; the possibility of calibrating the equipment with weights or with a force measuring instrument, the calibrating equipment being required to be more accurate than the test instrument; and a base plate and force-applying plate that are firmly fixed, so as to prevent the pellet from rolling or being displaced before the test begins.

A mechanical sieve shaker meeting the requirements of the test method of GB/T 14853.5.

Test sieves of 200 mm by 25 mm with a 1.4 mm aperture and of 200 mm by 25 mm with a 1.7 mm aperture, complying with GB/T 6003.1, used to separate the carbon black. For carbon blacks of which very little is retained on the 1.4 mm test sieve, such as acetylene black and thermal black, test sieves of 200 mm by 25 mm with a 1.18 mm aperture and of 200 mm by 25 mm with a 1.0 mm aperture may be used.