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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 3780.31-2025

Carbon black - Part 31: Determination of total hydrogen content

炭黑 第31部分：总氢元素含量的测定

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting. This document is Part 31 of GB/T 3780 "Carbon Black". GB/T 3780 "Carbon Black" has been published in the following parts.

1.Test method for iodine adsorption value;

2.Determination of oil absorption;

4.Determination of oil absorption value of compression specimen;

5.Determination of specific surface area - CTAB method;

6.Determination of tinting strength;

7.Determination of pH value;

8.Determination of loss on heating;

10.Determination of ash content;

12.Inspection of impurities;

14.Determination of sulfur content;

15.Determination of light transmittance of toluene extract;

17.Indirect determination of particle size - reflectivity method;

1 Scope

Part 31 of China's national standard series for carbon black, covering the determination of

total hydrogen content. It describes the determination of the hydrogen released above 2000 degrees C using a thermal conductivity detector. Carbon black is made by burning or thermally decomposing hydrocarbon feedstock under controlled conditions, and the product is nearly pure carbon - but not entirely. Hydrogen remains, bonded at the edges of the graphitic layers that make up each particle, and how much remains is a direct record of how completely the feedstock was decomposed and at what temperature. That makes it a process indicator rather than a contaminant specification. It also has a direct consequence in use: the surface chemistry of a carbon black determines how it interacts with the rubber it reinforces, and hydrogen content is part of that. Since carbon black is the second largest ingredient in a tyre after the rubber itself, small differences in its surface matter across enormous tonnages.

This document describes the determination of the total hydrogen content in carbon black that can be released above.2000°C using a thermal conductivity detector (TCD). This document applies to the determination of carbon black for rubber.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 3778 Carbon black for rubber

GB/T 7767 Terminology of Carbon Black

GB/T 8170 Rules for rounding off values and expression and determination of limit values

3 Terms and Definitions

The terms and definitions defined in GB/T 7767 apply to this document.

4 Principles

Under the protection of inert gas argon, the high temperature melting method was used to extract hydrogen from the carbon black sample wrapped in nickel capsule to obtain hydrogen. The sample is transported to the thermal conductivity detector under the guidance of argon gas, and the hydrogen content in the sample is calculated based on the hydrogen signal intensity.

5 Reagents or materials

5.1 Argon, purity 99.999% or above.

5.2 Nitrogen, purity 99.5% or above.

5.3 Anhydrous magnesium perchlorate. analytical grade.

5.4 Alkali asbestos. analytical grade.

5.5 Room-temperature oxidizing agents. The choice of reagents shall be based on the instrument manufacturer's recommendations.

5.6 Hydrogen reference sample. The hydrogen content is known.

5.7 Nickel capsule. Made of high-purity nickel.

5.8 Graphite crucible. made of high-purity graphite.

5.9 Tin particles. Made of high-purity tin.

6 Instruments and Equipment

6.1 Hydrogen element analyzer, using thermal conductivity detector (TCD), heating temperature can reach 3500°C, with flux degassing function. Figure 1 shows the