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

GB/T 13531.7-2018

**General methods on determination of cosmetics -
Determination of refractive index**

化妆品通用检验方法 折光指数的测定

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Foreword

GB/T 13531 General methods on determination of cosmetics is divided into the following parts: GB/T 13531.1 General methods on determination of cosmetics - Determination of pH value; GB/T 13531.3 General methods on determination of cosmetics - Determination of turbidity; GB/T 13531.4 General methods on determination of cosmetics - Determination of relative density; GB/T 13531.6 General methods on determination of cosmetics - Determination of particle size (fineness); GB/T 13531.7 General methods on determination of cosmetics - Determination of refractive index.

This part is Part 7 of GB/T 13531. It is drafted in accordance with the rules given in GB/T 1.1-2009.

This part was proposed by the China National Light Industry Council.

This part is under the jurisdiction of the National Technical Committee on Perfume, Flavour and Cosmetic of Standardization Administration of China (SAC/TC 257).

The drafting organizations of this part are the Shanghai Daily Chemical Industry Research Institute, Anton Paar (China) Ltd., Guangdong Bawei Biotechnology Co. Ltd., Proya Cosmetics Co. Ltd., Pigeon Manufacturing (Shanghai) Co. Ltd. and Amore Pacific Cosmetics (Shanghai) Co. Ltd.

1 Scope

The Chinese national test method for measuring the refractive index of a cosmetic. Refractive index is one of the cheapest and most sensitive fingerprints a liquid has: it is fixed by composition, it can be read in under a minute from a drop of sample, and a batch of oil, essence or emulsion that has been diluted, substituted or wrongly compounded will usually show it in the fourth decimal place before any other routine test notices. That is why it appears in incoming goods control on raw materials and in release testing on finished product. This part of GB/T 13531 specifies the method for determining the refractive index of liquid and semi-solid cosmetics. It gives two methods: the first uses the Abbe refractometer, which measures the angle of refraction or observes the critical line of total reflection directly and requires a homogeneous, transparent sample, and is used for transparent liquid cosmetics; the second uses an automatic refractometer, in which an LED source illuminates the prism surface over a range of angles and a high-resolution sensor array finds the critical angle of total reflection, and which can be used for liquid or semi-solid cosmetics. For each method the standard sets out the principle, the reagents and reference substances used for calibration, the apparatus and its required accuracy, the procedure including the preparation and the temperature control of the sample, the way the result is expressed, and the precision required between two parallel determinations. It is used by cosmetic manufacturers, contract laboratories and the inspection bodies that test cosmetics on the Chinese market.

This part of GB/T 13531 specifies the method for the determination of the refractive index of liquid and semi-solid cosmetics.

The first method of this part applies to the determination of the refractive index of transparent liquid cosmetics.

The second method of this part applies to the determination of the refractive index of liquid or semi-solid cosmetics.

2 Terms and definitions

The following terms and definitions apply to this document.

2.1 refractive index: the ratio of the sine of the angle of incidence to the sine of the angle of refraction, when a ray of light of a given wavelength passes from air into a sample held at a constant temperature.

NOTE: The wavelength is specified as the sodium D line, and the tolerance on it is given in

the note to this definition.

3.1 Principle

The measurement of the refractive index of a sample by the Abbe refractometer is based on the law of refraction and on the principle of determining the critical angle, either by measuring the angle of refraction directly or by observing the critical line of total reflection. The sample under test shall be kept homogeneous and transparent.

3.2 Reagents

3.2.1 Unless otherwise stated, all reagents used are of analytical grade and the water used is distilled water or water of equivalent purity.

3.2.2 Reference substances. The reagents whose refractive index is used to calibrate the refractometer are distilled water, p-cymene, benzyl benzoate and 1-bromonaphthalene, each with its own certified refractive index at the reference temperature.

3.3 Apparatus

3.3.1 Abbe refractometer, able to read refractive index directly over the range stated in this clause and with the precision stated there.

3.3.2 Constant temperature water bath, or a device able to hold the temperature constant, ensuring that the circulating water flowing through the Abbe refractometer keeps it within the stated tolerance of the specified test temperature.

3.3.3 Light source: sodium light. Where diffuse daylight or a lamp is used as the light source of the refractometer, an achromatic compensating prism shall be used.

3.3.4 Glass plate of known refractive index, optional.

3.4.1 Preparation of the test sample

Bring the temperature of the test sample close to the test temperature.

3.4.2 Calibration of the Abbe refractometer

3.4.2.1 The Abbe refractometer is calibrated by measuring the refractive index of the reference substances. NOTE: some instruments may be adjusted directly with the glass plate in accordance with the manual supplied by the instrument manufacturer.

3.4.2.2 The Abbe refractometer shall be held at the specified test temperature. During the determination the temperature shall not fluctuate beyond the stated tolerance. NOTE: a reference temperature is given, and the specific temperature is to be taken from the relevant product standard.

3.5 Expression of results

The result of the determination is expressed as the mean of two determinations, retained to the number of decimal places stated in this clause.

3.6 Precision

The absolute error between two parallel determinations shall not exceed the value given in this clause.

4.1 Principle

The measurement of the refractive index of a sample by an automatic refractometer is based on the determination of the critical angle of total reflection.

An LED source directs light at a range of different angles onto the surface of the prism in contact with the sample. Because the refractive indices of the sample and of the prism differ, the light is partly refracted and partly reflected, or is totally reflected beyond the critical angle.

A high-resolution sensor array measures the intensity of the reflected light, from which the critical angle of total reflection can be calculated, and the refractive index of the sample can then be determined from that critical angle.

4.2 Apparatus

4.2.1 Automatic refractometer with an automatic temperature control function, or equivalent.

4.2.2 The required accuracy of the automatic refractometer is stated in this clause for the temperature and for the refractive index, each over the working range given there.

4.3 Procedure

4.3.1 Before the test, calibrate the instrument in accordance with the requirements of the instrument manual.

4.3.2 Set the temperature of the instrument to the temperature at which the determination is to be made.

4.3.3 Using a dropper, introduce the test sample into a clean, dry measuring cell; the sample shall cover the prism.

4.3.4 When the instrument displays a stable refractive index, record that value.

4.3.5 After the measurement, wipe the prism with dust-free wiping paper or lens tissue.

4.4 Expression of results