



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

**GB/T 7383-2020**

---

**Non-ionic surface active agents - Determination of hydroxyl  
value**

**Issued on: December 14, 2020**

**Implemented on: July 1, 2021**

---

**Issued by: SAMR; SAC**

## Table of Contents

|                                                                                                                 |    |
|-----------------------------------------------------------------------------------------------------------------|----|
| Foreword .....                                                                                                  | 3  |
| 1 Scope .....                                                                                                   | 5  |
| 2 Normative References .....                                                                                    | 6  |
| 3 Terms and Definitions .....                                                                                   | 6  |
| 4 Method A - Phthalic Anhydride Method (arbitration method) .....                                               | 7  |
| 5 Method B - Acetic Anhydride Method (arbitration method) .....                                                 | 12 |
| 6 Method C - Near-infrared spectroscopy .....                                                                   | 15 |
| 7 Arbitration Method .....                                                                                      | 19 |
| 8 Test Report .....                                                                                             | 19 |
| Appendix A (informative) Structural Changes between this Standard and ISO<br>4326:1980 .....                    | 20 |
| Appendix B (normative) Determination of Purity of Phthalic Anhydride .....                                      | 22 |
| Appendix C (normative) Determination of Hydroxyl Value outside Fume Hood .....                                  | 23 |
| Appendix D (informative) Sampling Range of Specimens with Different Water Contents<br>and Hydroxyl Values ..... | 27 |
| Appendix E (informative) Example of Establishment of Calibration Model .....                                    | 29 |

### 1 Scope

This Standard specifies the determination of hydroxyl value in non-ionic surface active agents.

This Standard is applicable to the determination of hydroxyl value (the hydroxyl value of adducts of ethylene oxide and propylene oxide of primary fatty alcohols, alkylphenols and fatty acids, and their mixtures) of aliphatic and cycloaliphatic poly alkoxy compounds, which is suitable for the determination of hydroxyl value in 10 ~ 1,000.

The phthalic anhydride method is suitable for the determination of the hydroxyl value of adducts of ethylene oxide and propylene oxide of primary and secondary fatty alcohols, alkylphenols and fatty acids, and their mixtures.

The acetic anhydride method is suitable for the determination of the hydroxyl value of adducts of ethylene oxide of primary and secondary fatty alcohols, alkylphenols and fatty acids, but not for the determination of the hydroxyl value of propoxylated products.

The near-infrared method is suitable for non-ionic surface active agents whose hydroxyl value can be determined by the phthalic anhydride method or the acetic anhydride method.

Interfering substances are as follows:

---Primary and secondary amines, amides, tertiary alcohols, thiols and epoxides generate side reactions that affect the accuracy of the method.

---Long-chain aliphatic acids and esters generate more stable anhydrides than phthalic anhydride acetic anhydride, which cannot be completely decomposed at the end of the determination.

---Other free acids cause interference due to the reaction with the sodium hydroxide standard solution, and alkalis, including certain tertiary amines, cause interference due to the reaction with the generated phthalic acid and acetic acid.

The presence of epoxides interferes with the determination. If they can be removed by the low-temperature vacuum distillation method without changing the hydroxyl value, this method is still applicable. The above-mentioned treatment can eliminate free ethylene oxide that causes interferences and with a concentration (mass fraction) higher than 0.5%.

The moisture present in the specimen will react with phthalic anhydride and acetic anhydride, but this method is still applicable if the measures described in the determination procedures are followed for prevention.

## 2 Normative References

The following documents are indispensable to the application of this document. 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.

GB/T 601 Chemical Reagent - Preparations of Standard Volumetric Solutions

GB/T 2384 Dyes Intermediates - General Method for the Determination of Melting Range

GB/T 3143 Color Determination Method of Liquid Chemicals - Hazen Unit - Platinum - Cobalt Scale

GB/T 6365 Surface Active Agents - Determination of Free Alkalinity or Free Acidity - Titrimetric Method (GB/T 6365-2006, ISO 4314:1977, IDT)

GB/T 6372 Surface Active Agents and Detergents - Methods of Sample Division (GB/T 6372-2006, ISO 607:1977, IDT)

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 11275 Surface Active Agents - Determination of Water Content (GB/T 11275-2007, ISO 4317:1991, MOD)

GB/T 29858 Standard Guidelines for Molecular Spectroscopy Multivariate Calibration

## Quantitative Analysis

ISO 4327 Non-ionic Surface Active Agents - Polyalkoxylated Derivatives - Determination of Hydroxyl Value - Phthalic Anhydride Method

### 3 Terms and Definitions

The following terms and definitions are applicable to this document.

#### 3.1 hydroxyl value (OH)

Hydroxyl value refers to the number of milligrams of potassium hydroxide required to neutralize the acid generated by the esterification of hydroxyl groups in 1 g of specimen with phthalic anhydride or acetic anhydride.

#### 3.2 modeling samples

Modeling samples refer to a series of representative samples selected for the establishment of the calibration model.

#### 3.3 validation samples

Validation samples refer to a series of representative samples selected for the validation of the calibration model.

#### 3.4 calibration

Calibration refers to the process of establishing a model by correlating the concentration or properties of a group of samples with their spectra.

#### 3.5 calibration model

Calibration model refers to a mathematical expression that expresses the correlation between the composition and concentration or properties of a group of samples and their spectra.

#### 3.6 estimate

Estimate refers to the process of calculating the concentration or properties of sample composition using the calibration model and the sample's spectrum.

#### 3.7 abnormal value

Abnormal value refers to the data points corresponding to samples for which the model estimate value is significantly different from the reference value.

### 3.8 mahalanobis distance

Mahalanobis distance represents the covariance distance of the data, which is an effective method of calculating the similarity of two unknown sample spectra.

## 4 Method A - Phthalic Anhydride Method (arbitration method)

### 4.1 General Rules

The phthalic anhydride method shall comply with the method provided in ISO 4327.

### 4.2 Principle

In pyridine solution, use phthalic anhydride to esterify the hydroxyl value.

$c(\text{NaOH}) = 0.5 \text{ mol/L}$ , prepare in accordance with the stipulations of GB/T 601.

### 4.3.4 Phenolphthalein indicator

1 g of phenolphthalein is dissolved in 100 mL of pyridine.

### 4.4.1 Alkaline burette

The capacity is 50 mL.

### 4.4.2 Flat-bottomed flask

The capacity is 250 mL, with conical ground glass joints.

### 4.4.3 Air condenser

An air condenser with an effective length greater than 600 mm, with conical ground glass joints.

### 4.4.4 One-mark pipette

The capacity is 25 mL.

### 4.5.1 General rules

In accordance with the stipulations of GB/T 6372, prepare and store samples. In addition, in accordance with the stipulations of GB/T 11275, determine the water content in the sample. All operations shall be carried out in a well-ventilated fume hood. The glassware used shall be clean and dry, and the determination of two samples and two blank tests shall be simultaneously carried out. See Appendix C for the instruments and methods that need to