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

GB/T 3401-2007

**Determination of the viscosity of Poly (vinyl chloride) resins in
dilute solution using capillary viscometers**

(English Translation)

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Foreword

This Standard modifies and adopts ISO 1628-2:1998 "Determination of the viscosity of Polymers in dilute solution using capillary viscometers - Part 2. Poly (vinyl chloride) resins" (English edition) (confirmed on October 3, 2003).

This Standard was redrafted in accordance with ISO 1628-2:1998. The table for comparison between the chapter-clause number of this Standard and the chapter-clause number of ISO 1628-2:1998 is listed in Appendix A.

Considering China's national conditions, in the adoption of ISO 1628-2:1998, this Standard has made some changes. The technical differences have been incorporated into the text and identified by vertical single lines in the margins of the clauses they refer to. A table for

these technical differences and their causes is given in Appendix B for reference.

For ease of use, the following editorial changes have been made to this Standard.

- a) The word "this part of ISO 1628" is replaced by the word "this Standard";
- b) REPLACE the comma "," as a decimal point with a decimal point ".";
- c) DELETE the foreword of the international standard.

This Standard replaces GB/T 3401-1999 "Determination of viscosity number of PVC resins in dilute solution".

The main technical differences between this Standard and GB/T 3401-1999 are.

- MODIFY the standard's name;
- MODIFY the requirement for the volatile-matter content of sample (Chapter 7 of 1999 edition; Chapter 1 of this edition);
- ADD the definition of K-value (3.2 of this edition);
- ADD test method A for sample weight of 0.250 g (9.1.1 of this edition);
- DELETE "Method 2" (8.1.2 of 1999 edition);
- MODIFY the range of sampling quantity (8.1.1 of 1999 edition; 9.1.2 of this edition);
- MODIFY the range of control temperature of temperature-regulated bath (8.2 of 1999 edition; 9.2 of this edition);
- MODIFY the relative deviation requirement for parallel determination (Chapter 9 of 1999 edition; 10.1 of this edition);
- ADD the calculation of K-value (10.2 of this edition);
- ADD the chapter "Precision" (Chapter 11 of this edition);
- ADD Table 3 "Conversion of viscosity ratio (VR) to reduced viscosity (I) and K-value";
- CHANGE "Calculation method of cyclohexanone dosage in the preparation of 0.005 g/mL solution by conical flask method" to Appendix D "Solution preparation by conical flask method" (Appendix A of 1999 edition; Appendix D of this edition);
- ADD Appendix A "Comparison between the chapter-clause number of this Standard and the chapter-clause number of ISO 1628-2:1998";
- ADD Appendix B "Technical differences between this Standard and ISO 1628-2:1998 and their causes";
- CHANGE "Determination of the kinematic viscosity of cyclohexanone" to Appendix C (Appendix B of 1999 edition; Appendix C of this edition);

- ADD Appendix E "Cleaning of apparatus".

Appendix A, Appendix B, Appendix C, Appendix D, and Appendix E of this Standard are informative annexes.

This Standard was proposed by China Petroleum and Chemical Industry Federation.

This Standard shall be under the jurisdiction of Branch of PVC Resin Products, National Technical Committee 15 on Plastic of Standardization Administration of China (SAC/TC 15/SC 7).

Drafting organizations of this Standard. Jinxi Research Institute of Chemical Industry, Fujian Southeast Electrochemical Co., Ltd..

Main drafters of this Standard. Hao Jing, Sun Lijuan, Zhao Min, Chen Peiyun.

This Standard was first issued in 1982 and first revised in 1999.

Attention is drawn to the possibility that some of the elements of this Standard may be the subject of patent rights. The issuing authority of this Standard shall not be held responsible for identifying any or all such patent rights.

Determination of the viscosity of Poly (vinyl chloride) resins in dilute solution using capillary viscometers

1 Scope

This Standard specifies conditions for the determination of the reduced viscosity (also known as viscosity) and K-value of PVC resins. It is applicable to resins in powder form which consist of homopolymers of the monomer vinyl chloride and copolymers, terpolymers, etc., of vinyl chloride with one or more other monomers, but where vinyl chloride is the main constituent. The resins may contain small amounts of unpolymerized substances (e.g. emulsifying or suspending agents, catalyst residues, etc.) and other substances added during the course of the polymerization. This Standard is not applicable, however, to resins having a volatile-matter content in excess of 0.5%, when determined in accordance with GB/T 2914. In addition to this, it is not applicable to resins which are not entirely soluble in cyclohexanone.

The reduced viscosity and K-value of a particular resin are related to its molecular mass, but the relationship varies depending on the concentration and type(s) of other monomer(s) present. Hence homopolymers and copolymers having the same reduced viscosity or K-value may not have the same molecular mass.

The values determined for reduced viscosity and K-value, for a particular sample of PVC resin, are influenced differently by the concentration of the solution chosen for the determination. Hence the use of the procedures described in this Standard will only give

values for reduced viscosity and K-value that are comparable when the concentrations of the solutions used are identical.

2 Normative references

The clauses in the following documents, by reference in this Standard, constitute the clauses of this Standard. For the dated references, the subsequent amendments (not including errata content) or revisions do not apply to this Standard. However, parties which have reached an agreement according to this Standard are encouraged to study whether the latest edition of these documents can be used. For the undated references, the latest edition is applicable to this Standard.

GB/T 2914-1999 Plastics - Homopolymer and copolymer resins of vinyl chloride - Determination of volatile matter (including water) (idt ISO 1269:1980)

3 Terms and definitions

The following terms and definitions apply to this Standard.

3.1 Reduced viscosity (also known as viscosity)

The ratio of the viscosity ratio increment to the polymer concentration c in the solution.

If the solution concentration is low, the viscosity ratio η/η_0 can be given by the efflux time ratio t/t_0 , then the reduced viscosity can be expressed as.

The dimension of reduced viscosity is L^3M^{-1} .

The unit of reduced viscosity is m^3/kg .

In practical applications, it is more convenient to use its $1/1000$ ($10^{-3}m^3/kg$), that is, mL/g . The so-called viscosity number refers to the reduced viscosity (viscosity number) of this empirical unit.

The reduced viscosity is usually measured at a low concentration (less than $5 kg/m^3$, i.e., $0.005 g/mL$) unless the concentration is increased for a polymer having a low molecular mass.

3.2 K-value

A constant which is independent of the concentration of polymer solution and is unique to the polymer sample, which is a measure of average degree of polymerization.

Where.