
**Plastics — Determination of average
molecular mass and molecular mass
distribution of polymers using size-
exclusion chromatography —**

**Part 2:
Universal calibration method**

*Plastiques — Détermination de la masse moléculaire moyenne
et de la distribution des masses moléculaires des polymères par
chromatographie d'exclusion stérique —*

Partie 2: Méthode d'étalonnage universelle



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 16014-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 16014 2:2003). The main changes are as follows:

- a) the scope has been editorially revised;
- b) the normative references have been updated.

ISO 16014 consists of the following parts, under the general title *Plastics — Determination of average molecular mass and molecular mass distribution of polymers using size-exclusion chromatography*:

- *Part 1: General principles*
- *Part 2: Universal calibration method*
- *Part 3: Low-temperature method*
- *Part 4: High-temperature method*
- *Part 5: Method using light-scattering detection*

Plastics — Determination of average molecular mass and molecular mass distribution of polymers using size-exclusion chromatography —

Part 2: Universal calibration method

1 Scope

This part of ISO 16014 specifies a method for determining the average molecular mass and the molecular mass distribution of polymers using size-exclusion chromatography (SEC). The average molecular mass and the molecular mass distribution are calculated using a universal calibration curve instead of the conventional calibration curve.

A list of documents related to this part of ISO 16014 is given in the Bibliography.

NOTE The concept of the universal calibration method is based on a relationship by which the retention time in SEC depends on the size of the polymer molecule (the hydrodynamic volume) or on the product of the intrinsic viscosity $[\eta]$ and the molecular mass M . Many polymers classified as random-coil polymers (regardless of their chemical structure, degree of branching, composition or tacticity) have been experimentally confirmed as following this relationship. The universal calibration curve is prepared by plotting the logarithm of $[\eta]M$ against the elution time t or elution volume V using polymer standards such as polystyrene with narrow molecular mass distributions. The molecular mass M_i of an unknown polymer sample can then be calculated from the value of $[\eta]M$ at each retention time using the universal calibration curve and $[\eta]$ or K and a in the Mark-Houwink-Sakurada equation ($[\eta] = KM^a \rightarrow [\eta]M = KM^{a+1}$), where K is a constant and a is an exponent depending on the experimental conditions. Therefore this test method is classified as a relative method as described in ISO 16014-1, but the average molecular masses and molecular mass distributions calculated by the method are equal to, or nearly equal to, the absolute values.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 472, *Plastics — Vocabulary*

ISO 16014-1:2012, *Plastics — Determination of average molecular mass and molecular mass distribution of polymers using size-exclusion chromatography — Part 1: General principles*

ISO 16014-3:2012, *Plastics — Determination of average molecular mass and molecular mass distribution of polymers using size-exclusion chromatography — Part 3: Low-temperature method*

ISO 16014-4:2012, *Plastics — Determination of average molecular mass and molecular mass distribution of polymers using size-exclusion chromatography — Part 4: High-temperature method*