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**Plastics – Determination of average molecular mass and mixture ratio of poly(ethylene glycol) and its derivatives by MALDI-TOF-MS (ISO 19929:2017)**

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**Plastics — Determination of average  
molecular mass and mixture ratio  
of poly(ethylene glycol) and its  
derivatives by MALDI-TOF-MS**

*Plastiques — Détermination de la masse moléculaire moyenne et  
du rapport de mélange du poly(éthylène glycol) et de ses dérivés par  
MALDI-TOF-MS*



# ISO 19929:2017(E)



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## ISO 19929:2017(E)

### 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

## Introduction

For quality control and research of polymeric materials, it is important to know the composition of polymer mixtures with different terminal groups. In contrast to traditional methods such as liquid chromatography, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS) is a rapid and effective method to characterize polymer mixtures because of its high mass resolution. It can also be applied to quantitation of mixtures of different polymers. Interlaboratory comparisons of quantitative MALDI-TOF-MS performed for mixtures of PEG and its derivatives can ensure standardized conditions of measurement. Standardization of quantitative MALDI-TOF-MS may promote increasing applications of this analytical technique.





# Plastics — Determination of average molecular mass and mixture ratio of poly(ethylene glycol) and its derivatives by MALDI-TOF-MS

## 1 Scope

This document specifies a general method for determining the average molecular mass and mixture ratio of poly(ethylene glycol) (PEG) and its derivatives with different end groups by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS). It is applicable to PEG and its derivatives with molecular masses from 500 g mol<sup>-1</sup> to 20 000 g mol<sup>-1</sup>. The composition is calculated by means of a calibration curve constructed using standard polymer mixtures, where the peak area ratio is plotted versus the mass ratio. This document can be applied to other polymers with monomeric unit similar to PEG.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10927:2011, *Plastics — Determination of the molecular mass and molecular mass distribution of polymer species by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472, ISO 10927 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### **matrix-assisted laser desorption/ionization time-of-flight mass spectrometry MALDI-TOF-MS**

technique in which the separation is based on different flight times in a field free flight tube depending on the mass of formed polymer ions after ionization by a laser, desorption and acceleration by high voltage

### 3.2

#### **peak area**

*A*

sum of peak areas,  $A_{ij}$ , where  $A_{ij}$  is an area under the curve of the mass,  $M_{ij}$ , associated with the  $j$ -th species of polymer  $i$

Note 1 to entry: As [Figure 1 a\)](#) shows, integration for peak area,  $A_{ij}$ , should be performed over all isotopes related to the  $j$ -th species. If the software is not able to integrate all isotopic peaks, the peak area of the most abundant isotopic peak can be used instead [see [Figure 1 b\)](#)]. For data handling, see ISO 10927:2011, 6.7.