
**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*

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principles	3
5 Reagents	3
6 Apparatus	4
7 Procedure	5
7.1 General	5
7.2 Sample preparation	5
7.2.1 General	5
7.2.2 Preparation of polymer standard mixtures	6
7.2.3 Preparation of polymer/matrix/salt solutions	6
7.2.4 Deposition of the sample on the sample plate (target)	6
7.2.5 Preparation of biopolymer/matrix solutions	7
7.3 Instrument settings	7
7.4 Spectra recording	8
8 Data acquisition and processing	8
8.1 General	8
8.2 Calibration of mass axis	8
8.2.1 General	8
8.2.2 Calibration of mass axis using synthetic polymer standards	9
8.2.3 Calibration of mass axis using biopolymer standards	9
8.2.4 Self-calibration method	9
8.3 Generation of mass calibration curve	9
8.4 Calibration of intensity axis	9
9 Expression of results	10
9.1 Calculation of molecular mass distribution (MMD)	10
9.2 Calculation of the number-average molecular mass	10
9.3 Calculation of peak area	10
9.4 Constructing calibration curve for intensity	10
9.5 Calculation of mass ratio	11
10 Precision	11
11 Test report	11
11.1 General	11
11.2 Apparatus	11
11.3 Calibration	11
11.4 Results	11
Annex A (normative) Calibrants	12
Bibliography	13

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.

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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.

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.

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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⁻¹ to 20 000 g mol⁻¹. 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.