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Plastics — Polyethylene (PE) and polypropylene (PP) thermoplastics — Determination of metal content by ICP-OES

Plastiques — Polyéthylène (PE) et polypropylène (PP) — Détermination de la teneur en métal par ICP-OES

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Foreword

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Metal elements in polyethylene (PE) and polypropylene (PP) can lead to increased ash content and can impact material mechanical properties. In addition, some elements are also environmentally hazardous. This document provides a method to determine the metal content in PE and PP and it can serve as a measure for additive monitoring, quality control and post-reactor studies.

In this document, inductively coupled plasma optical emission spectrometry (ICP-OES) is used to determine the concentrations of certain elements in PE and PP. The main advantages of ICP-OES over atomic absorption spectroscopy (AAS) include multi-element measurement capability, longer linear dynamic range and less condensed phase interferences.

Plastics — Polyethylene (PE) and polypropylene (PP) thermoplastics — Determination of metal content by ICP-OES

WARNING — Persons using this document should be familiar with normal laboratory practice, if applicable. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices.

1 Scope

This document specifies a method for the determination of metal content in polyethylene (PE) and polypropylene (PP) by inductively coupled plasma optical emission spectrometry (ICP-OES).

This document is applicable to the determination of the content of magnesium (Mg), aluminium (Al), calcium (Ca), zinc (Zn), chromium (Cr), titanium (Ti), iron (Fe), antimony (Sb), copper (Cu), lead (Pb), cadmium (Cd), etc. This document is not applicable to the determination of mercury (Hg) due to its volatility.

This method is suitable for base polymers of PE, PP, PE/PP copolymer and their blends.

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 648, *Laboratory glassware — Single-volume pipettes*

ISO 1042, *Laboratory glassware — One-mark volumetric flasks*

ISO 3451-1, *Plastics — Determination of ash — Part 1: General methods*

3 Terms and definitions

No terms and definitions are listed in this document.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

PE and PP samples are incinerated and digested. Metal elements within are dissolved in aqueous solution. The solution is converted into aerosol via a nebulizer, and then injected into argon supported ICP-OES. At high temperature, the plasma atomizes metal elements in the solution and gives characteristic optical emission. The intensity of emission is proportional to the concentration of element. The content of metal elements in the sample is then calculated by comparing the emission intensities of the sample with the calibration curve.