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

GB/T 47903-2026

**Plastics - Determination of metal content in polyethylene (PE)
and polypropylene (PP) - Inductively coupled plasma optical
emission spectrometry**

塑料 聚乙烯 (PE) 和聚丙烯 (PP) 树脂中金属含量的测定 电感耦合等离子体发
射光谱法

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is modified to adopt ISO 24047:2021 "Plastics - Polyethylene (PE) and Polypropylene (PP) Thermoplastic Plastics - Inductively Coupled Plasma".

Determination of metal content by bulk emission spectroscopy.

The technical differences between this document and ISO 24047:2021, and the reasons therefor, are as follows.

- a) This document now includes testing guidelines for other polyolefin resins as well (see Chapter 1), making it more applicable.
- b) The emission principle of inductively coupled plasma emission spectroscopy has been added (see Chapter 4), making the principle more complete;
- c) Increased requirements for test water and referenced GB/T 6682 (see Chapter 5) to reduce the impact of metal elements in water on detection.
- d) The mass fraction of nitric acid was increased (see 5.1), clarifying the concentration requirements for nitric acid;
- e) Argon gas was added (see 5.4), and the purity requirements for argon gas were clarified;
- f) The sizes of beakers (see 6.3) and pipettes (see 6.7) have been expanded to increase user choice;
- g) ISO 648 (see 6.7) has been replaced with the normatively referenced GB/T 12808 to adapt to my country's technical conditions and increase operability.

Actual nature;

h) ISO 1042 (see 6.9) has been replaced with the normatively referenced GB/T 12806 to adapt to my country's technical conditions and increase operability.

Actual nature;

i) The description of fume hoods has been removed (see 6.10 in ISO 24047:2021). Fume hoods are common laboratory equipment and do not require further description.

describe;

j) Added steps for cleaning beakers with cleaning agents (see 7.1), clarifying the cleaning steps for beakers;

k) The criteria for determining the sample size have been added, and the content of the note in 7.3.1 has been incorporated into the main text (see 7.3.1) to increase operability;

l) Added the normative reference GB/T 9345.1-2008 (see 7.3.2), clarifying the operation of the sample heating process and increasing user-friendly features.

Operability;

m) The requirement for calcination temperature $(750\pm 50)^{\circ}\text{C}$ as selected according to ISO 3451-1 (see 7.3.3) has been removed to make the operation more scientific and reasonable;

n) Added the requirement for using a watch glass when solution splashes (see 7.3.5), clarifying the conditions for using watch glasses for users, while deleting...

Description of the petri dish in section 7.3.4;

o) Added requirements for handling turbid test solutions, incorporating the content of note 7.3.6 into the main text (see 7.3.6) to clarify for users the requirements regarding turbid test solutions.

Causes and handling requirements;

p) The recommended spectral wavelengths for magnesium have been increased (see Table 1), enhancing user selectivity;

r) Added requirements related to parallel experiments and result representation (see Chapter 9), increasing operability;

s) The requirements for test reports have been increased (see Chapter 11) to make the report information more complete.

The following editorial changes have been made to this document.

a) The note for 7.2.2 has been deleted (see note for 7.2.2 in ISO 24047:2021);

- b) Notes that other preprocessing methods are also suitable for this document have been removed (see note 7.3.3 in ISO 24047:2021);
- c) An explanation of the reasons for the turbidity of the test solution has been added (see note 7.3.6);
- d) The notes to Tables 1 and 2 have been deleted (see the notes to Tables 1 and 2 in ISO 24047:2021);
- e) ISO 5725-2 has been replaced by GB/T 6379.2 (see Annex A), which is cited in the informational reference.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Petroleum and Chemical Industry Federation.

This document is under the jurisdiction of the National Technical Committee on Plastics Standardization (SAC/TC15).

Introduction

And additives added during the resin molding process. High levels of residual metal elements can lead to increased resin ash content. This can be addressed by measuring the ash content in the resin.

The presence of residual metal elements can not only identify the main source of ash and find the reasons for high ash content, thus effectively controlling the ash content; it can also...

The quality of resin products can be improved by adjusting the ratio of catalysts and additives.

This document describes the determination of metal element content in PE and PP using inductively coupled plasma optical emission spectrometry (ICP-OES). Compared to the original...

Analog absorption spectroscopy (AAS) and ICP-OES have advantages such as simultaneous determination of multiple element contents, wide linear range, and less interference.

In plastic polyethylene (PE) and polypropylene (PP) resins Determination of metal content by inductively coupled plasma emission Spectroscopy Warning. It is essential that personnel with laboratory work experience use this document. This document does not address all potential safety issues.

Users are responsible for taking appropriate safety and health measures and ensuring compliance with relevant national regulations.

1 Scope

This document describes the determination of the content of polyethylene (PE) and polypropylene (PP) resins using inductively coupled plasma optical emission spectrometry (ICP-OES).

Methods for determining metal content.

This document applies to magnesium (Mg), aluminum (Al), calcium (Ca), and zinc in polyethylene (PE), polypropylene (PP) resins and their copolymers and blends.

Detection of metal content including Zn, chromium (Cr), titanium (Ti), iron (Fe), antimony (Sb), copper (Cu), lead (Pb), and cadmium (Cd). Other polyolefin resins.

This document can also be used as a reference for testing, but its precision has not been verified.

This document does not apply to the detection of volatile mercury (Hg) content.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

This document.

GB/T 6682 Specifications and test methods for water used in analytical laboratories GB/T 9345.1-2008 Determination of ash content in plastics - Part 1: General methods (ISO 3451-1:1997, IDT) GB/T 12806 Laboratory glassware - Single-mark volumetric flasks (GB/T 12806-2011, ISO 1042:1998, NEQ) GB/T 12808 Laboratory Glassware - Single-mark Pipettes

3 Terms and Definitions

This document does not contain any terms or definitions that need to be defined.

4 Principles

After ashing and digestion, the metal elements in the sample dissolve in the aqueous solution, which is then atomized by an atomizer and introduced as an aerosol.

In an inductively coupled plasma atomic emission spectrometer (ICP-AES), at high temperatures, the plasma atomizes or ionizes the metal elements in the solution, and the outer layer of the plasma...

Electrons are excited to transition to a higher energy state, and when they return to a lower energy state, they emit a characteristic spectrum. The emission intensity is proportional to