
**Plastics — Thermogravimetry (TG) of
polymers —**

**Part 3:
Determination of the activation
energy using the Ozawa-Friedman plot
and analysis of the reaction kinetics**

Plastiques — Thermogravimétrie (TG) des polymères —

*Partie 3: Détermination de l'énergie d'activation à l'aide du
graphique d'Ozawa-Friedman et analyse cinétique de la réaction*



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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.

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).

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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

ISO 11358 consists of the following parts, under the general title *Plastics — Thermogravimetry (TG) of polymers*:

- *Part 1: General principles*
- *Part 2: Determination of activation energy*
- *Part 3: Determination of the activation energy using the Ozawa-Friedman plot and the reaction kinetic analysis*

Introduction

Controlled rate thermogravimetry (CRTG) is used to study the decomposition of polymers. The Ozawa-Friedman method is typically applied to the analysis of data obtained by CRTG and also to that obtained by the combined use of isothermal thermogravimetry (iso-TG) with conventional linear heating rate thermogravimetry (LHTG), i.e. using a constant heating rate.

Plastics — Thermogravimetry (TG) of polymers —

Part 3:

Determination of the activation energy using the Ozawa-Friedman plot and analysis of the reaction kinetics

1 Scope

This International Standard specifies an analysis method for determining the activation energy using the Ozawa-Friedman plot. It also specifies the preparation of master plots for verification of the reaction kinetics determined by thermogravimetry.

The Ozawa-Friedman plot (logarithm of the rate of mass loss versus the reciprocal of absolute temperature at a given mass loss) is a derivative method that can be applied to data obtained by any mode of temperature change in thermal analysis; e.g. isothermal, constant heating rate, sample-controlled thermal analysis, temperature jump, and repeated temperature scanning.

2 Normative references

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

ISO 11358-1, *Plastics — Thermogravimetry (TG) of polymers — Part 1: General principles*

ISO 11358-2, *Plastics — Thermogravimetry (TG) of polymers — Part 2: Determination of activation energy*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11358-1, ISO 11358-2 and the following apply.

3.1 conversion

$$C = (m_t - m_i) / (m_f - m_i)$$

where

m_i is the initial quantity, in mg;

m_t is the quantity at a particular time and temperature, in mg;

m_f is the final quantity, in mg.

See ISO 11358-1 and ISO 11358-2.

Note 1 to entry: It is also referred to as the mass loss fraction.