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Plastics — Preparation of test specimens of thermoplastic materials using mouldless technologies

Part 1: General principles, and laser sintering of test specimens

AS ISO 27547.1:2021

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Plastics — Preparation of test specimens of thermoplastic materials using mouldless technologies

Part 1: General principles, and laser sintering of test specimens

First published as AS ISO 27547.1:2021.

Preface

This Standard was prepared by the Standards Australia Committee MB-028, Additive Manufacturing.

The objective of this document is to specify the general principles of test specimen preparation using mouldless techniques.

This document also specifies the general principles to be followed when test specimens of thermoplastic materials are prepared by laser sintering..

This document provides a basis for establishing reproducible sintering conditions.

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Foreword

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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.

ISO 27547-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, subcommittee SC 9, *Thermoplastic materials*.

ISO 27547 consists of the following part, under the general title *Plastics — Preparation of test specimens of thermoplastic materials using mouldless technologies*:

— *Part 1: General principles, and laser sintering of test specimens*

Further parts are planned covering other mouldless technologies.

Introduction

Many factors in a mouldless specimen-preparation process can influence the properties of the test specimens prepared and hence the measured values obtained when the specimens are used in a test method. The mechanical properties of such specimens are in fact strongly dependent on the conditions of the process used to prepare the specimens. Exact definition of each of the main parameters of the process is a basic requirement for reproducible operating conditions.

It is important in defining specimen-preparation conditions to consider any influence the conditions could have on the properties to be determined. Specimens prepared by mouldless techniques could show differences in molecular morphology (as with crystalline and semicrystalline polymers), differences in powder morphology (after undergoing a sintering process, for instance), differences in thermal history and differences in thickness of the layers used to prepare the specimen. Each of these will have to be controlled to avoid differences in the values of the properties measured.

NOTES

Australian Standard®

Plastics — Preparation of test specimens of thermoplastic materials using mouldless technologies

Part 1: General principles, and laser sintering of test specimens

1 Scope

This part of ISO 27547 specifies the general principles of test-specimen preparation using mouldless techniques. Sometimes, these techniques are called "tool-less" methods. Common to all these techniques is the fact that the specimens are produced layer by layer. The shape and dimensions of the specimens are defined in terms of a numerical description using CAD techniques. This computer model of the specimen is "sliced" into layers by means of suitable software. The specimen-preparation process then builds up the specimens automatically, layer by layer, using the computer model and a suitable computer-controlled laser-sintering machine. The three software systems used (for CAD, slicing the specimen into layers and machine control) may be independent systems interfacing separately with the machine or they may be integrated with the machine.

This part of ISO 27547 also specifies the general principles to be followed when test specimens of thermoplastic materials are prepared by laser sintering. The laser sintering process is used to prepare specimens layer-wise by sintering the particles of a thermoplastic powder using the energy of a laser beam.

This part of ISO 27547 provides a basis for establishing reproducible sintering conditions. Its purpose is to promote uniformity in describing the main parameters of the sintering process and also to establish uniform practice in reporting sintering conditions.

The particular conditions required for reproducible preparation of test specimens which will give comparable results will vary for each material used. These conditions shall be as given in the International Standard for the relevant material or shall be agreed upon between the interested parties.

2 Normative references

The following referenced documents are indispensable for the application 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 291, *Plastics — Standard atmospheres for conditioning and testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
laser wavelength
wavelength at the peak intensity of the laser used for sintering

Note 1 to entry: It is expressed in nanometres.

3.2
laser power
power of the laser beam

Note 1 to entry: It is expressed in watts.

Note 2 to entry: The laser power is usually different when producing the contour (outline) of the specimen and when hatching the specimen. Both values are therefore reported.