



Standard Guide for Preparation of Plastics and Polymeric Specimens for Microstructural Examination¹

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1. Scope

1.1 This guide covers recommended procedures and guidelines for the preparation of plastic and polymeric specimens for microstructural examination by light and electron microscopy.

1.2 This guide is applicable to most semi-rigid and rigid plastics, including engineering plastics. This guide is also applicable to some non-rigid plastics.

1.3 The procedures and guidelines presented in this guide are those which generally produce satisfactory specimens. This guide does not describe the variations in techniques required to solve individual problems.

1.4 Many detailed descriptions of grinding and polishing of plastics and polymers are available (1-7).²

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*³

D883 Terminology Relating to Plastics

E3 Guide for Preparation of Metallographic Specimens

E7 Terminology Relating to Metallography

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions used in this guide of terms directly related to metallography, refer to Terminology E7.

3.1.2 For definitions used in this guide of terms directly related to plastics and polymers, refer to Engineering Materials Handbook, Vol 2 (8) and Terminology D883.

3.1.3 *plastic(s)*—a material that contains as an essential ingredient one or more organic polymeric substances of large molecular weight; is solid in its finished state; and at some stage in its manufacture or processing into finished articles, can be shaped by flow.

3.1.4 *polymer(s)*—a substance consisting of molecules characterized by the repetition (neglecting ends, branch junctions, and other minor irregularities) of one or more types of monomeric units.

4. Significance and Use

4.1 One of the fundamental objectives of microstructural examination of manufactured materials, especially plastics and polymers, is to gain a more complete understanding of the relationships between the manufacturing processes, the microstructure and texture of the material, and the product's performance (that is, physical, optical, or mechanical properties, or combination thereof). Under nearly all conditions, the proper selection and preparation of the specimen are of major importance.

4.2 Because of the wide range of available equipment; physical, chemical, and mechanical properties of materials; and the personal element, specimen preparation is an art based upon scientific principles. However, like metallographic specimen preparation, certain methods, practices, and procedures can be used to routinely produce acceptable quality plastic and polymeric specimens for microstructural examination. Acceptable quality means:

4.2.1 The observed microstructure is free of thermal, mechanical, and chemical alterations, artifacts, damage, or defects resulting from the specimen preparation process.

4.2.2 A surface finish appropriate for the microscopical techniques to be used.

4.2.3 The microstructure is reproducibly displayed for a given specimen.

4.3 The mounting, sectioning, grinding, and polishing procedures in this guide may introduce thermal, mechanical, and chemical stresses on the material being prepared for microstructural examination. Thus, knowledge of the material's

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² The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.