



Standard Test Methods for Estimating the Largest Grain Observed in a Metallographic Section (ALA Grain Size)¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

Commercial material specifications sometimes include, in size limits for grain structures, the need for identification of the largest grain observed in a sample, often expressed as ALA (as large as) grain size. The methods presented here are for use when the number of large grains is too few for measurement by Test Methods E112. It shall be understood that larger (but unobserved) grains may exist in the local volume sampled.

1. Scope

1.1 These test methods describe simple manual procedures for measuring the size of the largest grain cross-section observed on a metallographically prepared plane section.

1.2 These test methods shall only be valid for microstructures containing outlier coarse grains, where their population is too sparse for grain size determination by Test Methods E112.

1.3 *This standard does not purport to address all of the safety problems, 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:²

E3 Guide for Preparation of Metallographic Specimens
E7 Terminology Relating to Metallography
E112 Test Methods for Determining Average Grain Size
E407 Practice for Microetching Metals and Alloys
E1181 Test Methods for Characterizing Duplex Grain Sizes

¹ This test method is under the jurisdiction of ASTM Committee E04 on Metallography and is the direct responsibility of Subcommittee E04.08 on Grain Size.

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² 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.

2.2 ASTM Adjuncts:

ALA Grain Size Visual Aid for Comparison Procedure (One Opaque Print and One Transparency)³

3. Terminology

3.1 Definitions:

3.1.1 All terms used in these test methods are either defined in Terminology E7, or are discussed in 3.2.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *ALA grain, n*—the largest grain observed in a random scatter of individual coarse grains comprising 5 % or less of the specimen area, where the apparent grain size of these coarse grains differs by 3 or more ASTM grain size numbers from the balance of the microstructure.

3.2.2 *outlier grain, n*—a grain substantially different in size from the predominant grain size in a microstructure; for example, an ALA grain.

4. Significance and Use

4.1 The presence of large grains has been correlated with anomalous mechanical behavior in, for example, crack initiation, crack propagation, and fatigue. Thus there is engineering justification for reporting the ALA grain size.

4.2 These methods shall only be used with the presence of outlier coarse grains, 3 or more ASTM grain size numbers larger than the rest of the microstructure and comprising 5 % or less of the specimen area. A typical example is shown in Annex A1 as Fig. A1.1.

³ Available from ASTM International Headquarters. Order Adjunct No. ADJE0930.