



Standard Practice for Production and Evaluation of Field Metallographic Replicas¹

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INTRODUCTION

Replication is a nondestructive sampling procedure which records and preserves the topography of a metallographic specimen as a negative relief on a plastic film. The microstructural replica can be examined using a light microscope (LM) or scanning electron microscope (SEM) for subsequent analysis. Specimens examined in the SEM are vacuum coated with vaporized carbon or a suitable metal to provide contrast and conductivity. The convenience of the replication process makes it suitable for obtaining microstructures from field locations for subsequent examination and analysis in a laboratory. The proper preparation of the test surface and of the replica itself is of paramount importance and must receive careful attention. Because of the diversity of metallographic equipment available and the wide range of environments in which replication is conducted, the preparation of replicas of high quality should be viewed as a skilled process for which there exists a variety of techniques that achieve satisfactory results.

This practice presents some guidelines on the preparation of metallic surfaces and production of replicas and guidelines on evaluation of replica quality. It does not attempt to limit the variations in technique developed by skilled metallographers, each of which may produce acceptable replicas.

1. Scope

1.1 This practice covers recognized methods for the preparation and evaluation of cellulose acetate or plastic film replicas which have been obtained from metallographically prepared surfaces. It is designed for the evaluation of replicas to ensure that all significant features of a metallographically prepared surface have been duplicated and preserved on the replica with sufficient detail to permit both LM and SEM examination with optimum resolution and sensitivity.

1.2 This practice may be used as a controlling document in commercial situations.

1.3 The values stated in SI units are to be regarded as the standard. Inch-pound units given in parentheses are for information only.

1.4 *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:

A 335/A 335M Specification for Seamless Ferritic Alloy-

Steel Pipe for High-Temperature Service²

E 3 Methods of Preparation of Metallographic Specimens³

E 7 Terminology Relating to Metallography³

E 407 Practice for Microetching Metals and Alloys³

3. Terminology

3.1 Definitions—For definitions of terms used in this practice, refer to Terminology E 7.

4. Significance and Use

4.1 Replication is a nondestructive sampling procedure that records and preserves the topography of a metallographically prepared surface as a negative relief on a plastic film (replica). The replica permits the examination and analysis of the metallographically prepared surface on the LM or SEM.

4.2 Enhancement procedures for improving replica contrast for microscopic examination are utilized and sometimes necessary (see 8.1).

NOTE 1—It is recommended that the purchaser of a field replication service specify that each replicator demonstrate proficiency by providing field prepared replica metallography and direct LM and SEM comparison to laboratory prepared samples of an identical material by grade and service exposure.

5. Evaluation Methods

5.1 A suitable replica should accurately reproduce all the

¹ This practice is under the jurisdiction of ASTM Committee E-4 on Metallography and is the direct responsibility of Subcommittee E04.01 on Selection and Preparation of Samples.

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² Annual Book of ASTM Standards, Vol 01.01.

³ Annual Book of ASTM Standards, Vol 03.01.