



Standard Practice for Analytically Describing Depth-Profile and Linescan-Profile Data by an Extended Logistic Function¹

This standard is issued under the fixed designation E1636; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes a systematic method for analyzing depth-profile and linescan data and for accurately characterizing the shape of an interface region or topographic feature. The profile data are described with an appropriate analytic function, and the parameters of this function define the position, width, and any asymmetry of the interface or feature. The use of this practice is recommended in order that the shapes of composition profiles of interfaces or of linescans of topographic features acquired with different instruments or techniques can be unambiguously compared and interpreted.

1.2 This practice is intended to be used for two purposes. First, it can be used to describe the shape of depth-profiles obtained at an interface between two dissimilar materials that might be measured by common surface-analysis techniques such as Auger electron spectroscopy, secondary-ion mass spectrometry, and X-ray photoelectron spectroscopy. Second, it can be used to describe the shape of linescans across a detectable topographic feature such as a step or a feature on a surface that might be measured by a surface-analysis technique, scanning electron microscopy, or scanning probe microscopy. The practice is particularly valuable for determining the position and width of an interface in a depth profile or of a feature on a surface and in assessments of the width as an indication of the sharpness of the interface or feature (a characteristic of the material system being measured) or of the achieved depth resolution of the profile or the lateral resolution of the linescan (a characteristic of the particular analytical technique and instrumentation).

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

E673 Terminology Relating to Surface Analysis (Withdrawn 2012)³

E1127 Guide for Depth Profiling in Auger Electron Spectroscopy

E1162 Practice for Reporting Sputter Depth Profile Data in Secondary Ion Mass Spectrometry (SIMS)

E1438 Guide for Measuring Widths of Interfaces in Sputter Depth Profiling Using SIMS

2.2 ISO Standards:⁴

ISO 18115 Surface Chemical Analysis – Vocabulary, 2001; Amd. 1:2006, Amd. 2:2007

ISO 18516 Surface Chemical Analysis – Auger Electron Spectroscopy and X-Ray Photoelectron Spectroscopy – Determination of Lateral Resolution, 2006

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, see Terminology **E673** and ISO 18115.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 Throughout this practice, three regions of a *sigmoidal profile* will be referred to as the *pre-interface*, *interface*, and *post-interface* regions. These terms are not dependent on whether a particular interface or feature profile is a growth or a decay curve. The terms *pre-* and *post-* are taken in the sense of increasing values of the independent variable *X*, the depth (for a depth profile) or the lateral position on the surface (for a linescan).

¹ This practice is under the jurisdiction of ASTM Committee **E42** on Surface Analysis and is the direct responsibility of Subcommittee **E42.08** on Ion Beam Sputtering.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.