



Standard Practice for Determination of the Specimen Area Contributing to the Detected Signal in Auger Electron Spectrometers and Some X-Ray Photoelectron Spectrometers¹

This standard is issued under the fixed designation E1217; 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 methods for determining the specimen area contributing to the detected signal in Auger electron spectrometers and some types of X-ray photoelectron spectrometers (spectrometer analysis area) when this area is defined by the electron collection lens and aperture system of the electron energy analyzer. The practice is applicable only to those X-ray photoelectron spectrometers in which the specimen area excited by the incident X-ray beam is larger than the specimen area viewed by the analyzer, in which the photoelectrons travel in a field-free region from the specimen to the analyzer entrance. Some of the methods described here require an auxiliary electron gun mounted to produce an electron beam of variable energy on the specimen (“electron-gun method”). Other experiments require a sample with a sharp edge, such as a wafer covered with a uniform clean layer (for example, gold (Au) or silver (Ag)) and cleaved to obtain a long side (“sharp-edge method”).

1.2 This practice is recommended as a useful means for determining the specimen area viewed by the analyzer for different conditions of spectrometer operation, for verifying adequate specimen and beam alignment, and for characterizing the imaging properties of the electron energy analyzer.

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

¹ This practice is under the jurisdiction of ASTM Committee E42 on Surface Analysis and is the direct responsibility of Subcommittee E42.03 on Auger Electron Spectroscopy and X-Ray Photoelectron Spectroscopy.

Current edition approved Nov. 1, 2011. Published December 2011. Originally approved in 1987. Last previous edition approved in 2005 as E1217 – 05. DOI: 10.1520/E1217-11.

2. Referenced Documents

2.1 *ASTM Standards*:²

E673 Terminology Relating to Surface Analysis (Withdrawn 2012)³

E1016 Guide for Literature Describing Properties of Electrostatic Electron Spectrometers

2.2 *ISO Standards*:⁴

ISO 18115:2001 Surface Chemical Analysis—Vocabulary

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

3. Terminology

3.1 *Definitions*—See Terminology E673 and ISO 18115:2001 for terms used in Auger electron spectroscopy and X-ray photoelectron spectroscopy.

4. Summary of Practice

4.1 *Electron-Gun Method*—An electron beam with a selected energy is scanned across the surface of a test specimen. The beam may be scanned once, that is, a line scan, or in a pattern, that is, rastered. As the electron beam is deflected across the specimen surface, measurements are made of the intensities detected by the electron energy analyzer as a function of the beam position for selected conditions of analyzer operation. The measured intensities may be due to electrons elastically scattered by the specimen surface, to electrons inelastically scattered by the specimen, or to Auger electrons emitted by the specimen. The intensity distributions for particular detected electron energy can be plotted as a function of beam position in several ways and can be utilized to obtain information on the specimen area contributing to the detected signal and on analyzer performance for the particular

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 American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.