Designation: E 827 – 07

Standard Practice for Identifying Elements by the Peaks in Auger Electron Spectroscopy[1]

This standard is issued under the fixed designation E 827; 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 outlines the necessary steps for the identification of elements in a given Auger spectrum obtained using conventional electron spectrometers. Spectra displayed as either the electron energy distribution (direct spectrum) or the first derivative of the electron energy distribution are considered.

1.2 This practice applies to Auger spectra generated by electron or X-ray bombardment of the specimen surface and can be extended to spectra generated by other methods such as ion bombardment.

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.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 673 Terminology Relating to Surface Analysis

E 983 Guide for Minimizing Unwanted Electron Beam Effects in Auger Electron Spectroscopy

E 984 Guide for Identifying Chemical Effects and Matrix Effects in Auger Electron Spectroscopy

E 1523 Guide to Charge Control and Charge Referencing Techniques in X-Ray Photoelectron Spectroscopy

3. Terminology

3.1 Terms used in Auger electron spectroscopy are defined in Terminology E 673.

4. Summary of Practice

4.1 The Auger spectrum is obtained with appropriate instrumental parameters from a low kinetic energy limit of approximately 30 eV to an upper kinetic energy limit of approximately 2000 to 3000 eV or higher to include all the principal Auger electron energies of all elements (except H and He which do not have Auger transitions).

4.2 This practice assumes the existence of appropriate reference spectra from pure element or stoichiometric compound standards, or both, with which an unknown spectrum can be compared (**1, 2**).[3] It may be useful to note that although Auger energies in some data bases are referenced to the Fermi level, other data collections have been referenced to the vacuum level. Auger kinetic energies referenced to the Fermi level would be approximately 5 eV larger than values referenced to the vacuum level.

4.3 An element in an Auger spectrum is considered positively identified if the peak shapes, the peak energies, and the relative signal strengths of peaks from the unknown coincide with those from a standard reference spectrum of the element or compound.

5. Significance and Use

5.1 Auger analysis is used to determine the elemental composition of the first several atomic layers, typically 1 to 5 nm thick, of a specimen surface. In conjunction with inert gas ion sputtering, it is used to determine the sputter depth profile to a depth of a few micrometres.

5.2 The specimen is normally a solid conductor, semiconductor, or insulator. For insulators, provisions may be required for control of charge accumulation at the surface (see Guide E 1523). Typical applications include the analysis of surface contaminants, thin film deposits or segregated overlayers on metallic or alloy substrates. The specimen topography may vary from a smooth, polished specimen to a rough fracture surface.

5.3 Auger analysis of specimens with volatile species that evaporate in the ultra-high vacuum environment of the Auger

[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 Oct. 1, 2007. Published December 2007. Originally approved in 1981. Last previous edition approved in 2002 as E 827 – 02.

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