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Standard Guide for Handling Specimens Prior to Surface Analysis[1]

This standard is issued under the fixed designation E 1829; 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 guide covers specimen handling and preparation prior to surface analysis and applies to the following surface analysis disciplines:

1.1.1 Auger electron spectroscopy (AES),

1.1.2 X-ray photoelectron spectroscopy (XPS or ESCA), and

1.1.3 Secondary ion mass spectrometry, SIMS.

1.1.4 Although primarily written for AES, XPS, and SIMS, methods also will apply to many surface-sensitive analysis methods, such as ion scattering spectrometry, low-energy electron diffraction, and electron energy loss spectroscopy, where specimen handling can influence surface-sensitive measurements.

1.2 *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:*

E 673 Terminology Relating to Surface Analysis[2]

E 1078 Guide for Specimen Preparation and Mounting in Surface Analysis[2]

3. Terminology

3.1 *Definitions*—For definitions of surface analysis terms used in this guide, see Terminology E 673. Specimens should be handled carefully so as to avoid the introduction of spurious contaminants. The goal must be to preserve the state of the surface so that analysis remains representative of the original subject.

4. Significance and Use

4.1 Proper handling and preparation of specimens is particularly critical for analysis. Improper handling of specimens can result in alteration of the surface composition, which results in erroneous data.

4.2 Auger electron spectroscopy, X-ray photoelectron spectroscopy, and secondary ion mass spectroscopy are sensitive to surface layers that are typically a few nanometres in thickness. Such thin layers can be subject to severe perturbations from improper specimen handling **(1)**.[3]

4.3 This guide describes methods to minimize the effects of specimen handling and preparation on the results obtained using surface-sensitive analytical techniques. It is intended for the specimen owner or the purchaser of surface analytical services and the surface analyst. Because of the wide range of types of specimens and desired information, only broad guidelines and specific examples are presented here. The optimum handling procedures will be dependent on the particular specimen and the needed information. It is recommended that the specimen preparer or owner consult the surface analyst as soon as possible with regard to specimen history, specific problem to be solved or information needed, and particular specimen preparation or handling procedures required. The surface analyst also is referred to Guide E 1078 that discusses additional procedures for preparing, mounting, and analysis of specimens.

5. General Requirements

5.1 The degree of cleanliness required by surface-sensitive analytical techniques often is much greater than for other forms of analysis. Scientists, engineers, and managers new to AES, XPS, and SIMS often need to be educated regarding these more stringent requirements.

5.2 *Contact*—Any handling of the surface area to be analyzed should be eliminated or minimized whenever possible.

5.3 *Hazardous Materials*—Special caution should be exercised with specimens containing potential toxins or other hazardous materials.

6. Specimen Influences

6.1 *History*—The history of a specimen can influence the handling of its surface. For example, if a specimen previously has been exposed to a contaminating environment, the need for exceptional care in handling might be less than for a specimen that came from a very clean environment.

6.2 *Information Sought*—The information sought can influence the handling of a specimen. If the information sought lies

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[2] *Annual Book of ASTM Standards*, Vol 03.06.

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

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