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Standard Practice for Reporting Sputter Depth Profile Data in Secondary Ion Mass Spectrometry (SIMS)[1]

This standard is issued under the fixed designation E 1162; 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 covers the information needed to describe and report instrumentation, specimen parameters, experimental conditions, and data reduction procedures. SIMS sputter depth profiles can be obtained using a wide variety of primary beam excitation conditions, mass analysis, data acquisition, and processing techniques **(1-4)**.[2]

1.2 *Limitations*—This practice is limited to conventional sputter depth profiles in which information is averaged over the analyzed area in the plane of the specimen. Ion microprobe or microscope techniques permitting lateral spatial resolution of secondary ions within the analyzed area, for example, image depth profiling, are excluded.

1.3 *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[3]

3. Terminology

3.1 For definitions of terms used in this practice, see Terminology E 673.

4. Summary of Practice

4.1 Experimental conditions and variables that affect SIMS sputter depth profiles **(1-4)** and tabulated raw data (where feasible) are reported to facilitate comparisons to other laboratories or specimens, and to results of other analytical techniques.

5. Significance and Use

5.1 This practice is used for reporting the experimental conditions as specified in Section 6 in the "Methods" or "Experimental" sections of other publications (subject to editorial restrictions).

5.2 The report would include specific conditions for each data set, particularly, if any parameters are changed for different sputter depth profile data sets in a publication. For example, footnotes of tables or figure captions would be used to specify differing conditions.

6. Information to Be Reported

6.1 *Instrumentation*:

6.1.1 If a standard commercial SIMS system is used, specify the manufacturer and instrument model number. Specify, the model numbers and manufacturer of any accessory or auxiliary equipment relevant to the depth profiling study (for example, special specimen stage, primary mass filter, electron flood gun, vacuum pumps, data acquisition system, and source of software, etc.).

6.1.2 If a nonstandard commercial SIMS system is used, specify the manufacturer and model numbers of components (for example, primary ion source, mass analyzer, data system, and accessory equipment).

6.2 *Specimen*:

6.2.1 Describe the specimen as completely as possible. For example, specify its bulk composition, preanalysis history, physical dimensions. If the specimen contains dopants, for example, semiconductors, report the dopant type and concentration. For multicomponent specimens, state the degree of specimen homogeneity.

6.2.2 State the method of mounting and positioning the specimen for analysis. Specify any physical treatment of the specimen mounted in the SIMS analysis chamber (for example, heated, cooled, electron bombarded, etc.). Note the specimen potential relative to ground. Describe the method of specimen charge compensation used (if any), for example, conductive coatings or grid, electron flooding, etc.

6.3 *Experimental Conditions*:

6.3.1 *Primary Ion Source*—Give the following parameters whenever possible: Composition (if mass filtered, give the specific ion and isotope, for example, $^{16}O^-$); angle of incidence (relative to the surface normal); ion beam energy; current (including the method used for measurement, for example, Faraday cup); beam diameter (including the method used for measurement); size and shape of sputtered area; primary beam

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[1] This practice is under the jurisdiction of ASTM Committee E-42 on Surface Analysis and is the direct reponsibility of Subcommittee E42.06 on SIMS.

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

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

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