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Standard Guide for Performing Sputter Crater Depth Measurements¹

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1. Scope

1.1 This guide covers the preferred procedure for acquiring and post-processing of sputter crater depth measurements. This guide is limited to stylus-type surface profilometers equipped with a stage, stylus, associated scan and sensing electronics, video system for sample and scan alignment, and computerized system.

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

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:*²

E673 [Terminology Relating to Surface Analysis](#)

E1162 [Practice for Reporting Sputter Depth Profile Data in Secondary Ion Mass Spectrometry \(SIMS\)](#) ~~Terminology Relating to Surface Analysis~~

3. Terminology

3.1 *Definitions:*

3.1.1 Terms used in surface analysis are defined in Terminology E673.

4. Significance and Use

4.1 Sputter crater depth measurements are performed in order to determine a sputter rate (depth/time) for each matrix sputtered during a sputter depth profile or similar in-depth type analyses. From sputter rate values, a linear depth scale can be calculated and displayed for the sputter depth profile.

4.2 Data obtained from surface profilometry are useful in monitoring instrumental parameters (for example, raster size, shape, and any irregularities in topography of the sputtered crater) used for depth profiles.

5. General Procedure

~~5.1 Upon~~ 5.1 Upon completing a sputter depth profile, mark the crater for future identification (one can mark the exterior corner(s) of a crater with features, for example, lines, holes, etc., produced using an unrastered ion beam). Note the ~~x- and y-position-crater orientation with respect to the rastered ion beam and other sample geometry or suitable device feature(s) features~~

5.2 Place the sample on the profilometer stage surface. If the sample has an area of less than 1 cm², mount the sample onto another larger flat surface to prevent sample movement when profilometry is performed. The system should be reasonably leveled; for details on instrumental adjustments, see manufacturer's ~~operational~~ operating manual(s). Keep the environment as dust-free as possible and dust-off the sample surface with a clean air/gas jet before performing the measurement.

5.3 Pre-select surface profilometer operational settings; computerized models are commonly used. Most surface profilometers commonly permit selection of the following parameters:

5.3.1 Stylus type (for example, diamond ~~stylus~~; stylus).

5.3.2 Stylus radius (for example, 5 μ m; various stylus radii are available depending upon desired resolution of measurement, and to a certain degree the strength of the stylus tip for varying hardness of materials);

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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.