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Nanomanufacturing – Large scale manufacturing for nanoelectronics

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NANOMANUFACTURING – LARGE SCALE MANUFACTURING FOR NANOELECTRONICS

FOREWORD

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International Standard IEC/IEEE 62659 has been prepared by IEC technical committee 113, Nanotechnology standardization for electrical and electronic products and systems, in cooperation with the Standards Committee of the IEEE Nanotechnology Council[1], under the IEC/IEEE Dual Logo Agreement.

The text of this standard is based on the following documents:

FDIS	Report on voting
113/271/FDIS	113/280/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The IEC Technical Committee and IEEE Technical Committee have decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

[1] A list of IEEE participants can be found at the following URL: http://standards.ieee.org/downloads/62659/62659-2015/62659-2015_wg-participants.pdf

INTRODUCTION

In order to fully benefit from the cost, performance, and flexibility of new electronics products manufactured on a large-scale, industries accustomed to the purchase, use, and engineering of continuum materials need to grow to embrace appropriate new practices at the nanoscale. The purpose of this International Standard is to enable the quick, low-risk adoption of nanomaterials into large-scale electronics manufacturing. In addition a best set of common practices for use by semiconductor fabricators will be delineated.

The description of nanomaterials to be incorporated into the electronics process can be described in terms of: composition (material), density, purity, size/dimensions, properties such as electrical characteristics (conductive, non-conductive, and semiconductive), associated media (delivery medium), fabrication, surface functionalization, particle size distribution, surface area, shape, and degree of aggregation and agglomeration, etc.

These standards for the characterization of nanomaterials also provide an opportunity to help ensure consistency in metrics and measurement methods when specifying or producing nanomaterials for electronics applications. This is important when multiple vendors or technology partners are involved.

NANOMANUFACTURING – LARGE SCALE MANUFACTURING FOR NANOELECTRONICS

1 Scope

This International Standard provides a framework for introducing nanoelectronics into large scale, high volume production in semiconductor manufacturing facilities through the incorporation of nanomaterials (e.g. carbon nanotubes, graphene, quantum dots, etc.). Since semiconductor manufacturing facilities need to incorporate practices that maintain high yields, there are very strict requirements for how manufacturing is performed. Nanomaterials represent a potential contaminant in semiconductor manufacturing facilities and need to be introduced in a structured and methodical way.

This International Standard provides steps employed to facilitate the introduction of nanomaterials into the semiconductor manufacturing facilities. This sequence is described below under the areas of raw materials acquisition, materials processing, design, IC fabrication, testing, and end-use. These activities represent the major stages of the supply chain in semiconductor manufacturing facilities.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

None.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
nanoscale
size range from approximately 1 nm to 100 nm

Note 1 to entry: Properties that are not extrapolations from a larger size will typically, but not exclusively, be exhibited in this size range. For such properties the size limits are considered approximate.

Note 2 to entry: The lower limit in this definition (approximately 1 nm) is introduced to avoid single and small groups of atoms from being designated as nano-objects or elements of nanostructures, which might be implied by the absence of a lower limit.

[SOURCE: ISO/TS 80004-1:2010, 2.1]

3.2
nanotechnology
application of scientific knowledge to manipulate and control matter in the **nanoscale** (3.1) in order to make use of size- and structure-dependent properties and phenomena, as distinct from those associated with individual atoms or molecules or with bulk materials

Note 1 to entry: Manipulation and control includes material synthesis.

[SOURCE: ISO/TS 80004-1:2010, 2.3]