

SEMI M16-1296

SPECIFICATION FOR POLYCRYSTALLINE SILICON

1 Preface

1.1 This specification covers requirements for polycrystalline silicon (poly) used to produce single crystal silicon by the Czochralski (Cz) crystal growth technique for applications in the semiconductor device industry. Form and dimensional characteristics are the only standardized properties set forth below.

1.2 A purchase specification may require that additional physical properties be defined. These properties are listed, together with test methods suitable for determining their magnitude.

2 Applicable Documents

2.1 ASTM Standards¹

E 122 — Practice for Choice of Sample Size to Estimate Average Quality of a Lot or Process

F 574 — Test Method for Evaluation of Polysilicon (In Revision)

P 213 — Proposed Test Method for Photoluminescence Analysis of Single Crystal Silicon for III-V Impurities

2.2 Other Standards

ANSI/ASQC Z1.4-1993 — Sampling Procedures and Tables for Inspection by Attributes²

AQAP-4 — NATO Inspection System Requirements for Industry

3 Terminology

etched polysilicon — polysilicon that has been etched with acid to remove surface contamination.

lot — all of the material of nominally identical purity and characteristics contained in a single shipment, manufactured with similar processing conditions, and traceable to the manufacturing conditions. A lot may be further defined as the polysilicon produced from one reactor run.

polycrystalline silicon — (Poly, polysilicon) silicon, formed by chemical vapor deposition from a silicon source gas, having a structure which contains large angle grain boundaries, twin boundaries, or both.

1 American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 (All cited standards except for E 122 may be found in Volume 10.05 of the Annual Book of ASTM Standards; E 122 may be found in Volume 14.02.)

2 American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202

4 Ordering Information

4.1 Purchase orders for polysilicon furnished to this specification shall include the following items:

4.1.1 Form

4.1.2 Size

4.1.3 Purity

4.1.4 Surface Texture

4.1.5 Surface Condition

4.1.6 Appearance

4.1.7 Lot Acceptance Procedures

4.1.8 Certification (if required)

4.1.9 Packing and Marking

5 Dimensions and Permissible Variations

5.1 The material shall conform to the dimensions and dimensional tolerances as specified in the appropriate polysilicon standard.

6 Materials and Manufacture

6.1 The material shall consist of polysilicon with the form specified in the purchase order or contract.

7 Physical Requirements

7.1 The material shall conform to the properties specified in the purchase order or contract, as follows:

7.1.1 Purity

7.1.2 Size

7.1.3 Surface Texture

7.1.4 Surface Condition

7.1.5 Appearance

8 Sampling

8.1 Unless otherwise specified, ASTM Practice E 122 shall be used. When so specified, appropriate sample sizes shall be selected from each lot in accordance with ANSI/ASQC Z1.4-1993. Inspection levels shall be agreed upon between the supplier and the purchaser. Alternately AQAP-4 may be used to determine sampling plan.

9 Test Methods

9.1 *Size* — Determine by a method agreed upon by the purchaser and the supplier.

9.2 *Purity* — Determine in accordance with ASTM Test Method F 574.

NOTE 1: Newer test methods are being developed, including photoluminescence (ASTM Proposed Test Methods P 213) and low temperature FTIR.

9.3 *Surface Texture* — Determine by a method agreed upon by the purchaser and the supplier. Visual limit standards shall be used to describe acceptable limits.

10 Certification

10.1 Upon request of the purchaser in the contract or order, a manufacturer's or supplier's certification that the material was manufactured and tested in accordance with the specification shall be furnished at the time of shipment (Certificate of Compliance). Upon request, a report of the test results may also be required (Certificate of Analysis).

10.2 In the interest of controlling inspection costs, the supplier and the purchaser may agree that the material shall be certified as "capable of meeting" certain requirements. In this context, "capable of meeting" shall signify that the supplier is not required to perform the appropriate test in Section 9. However, if the purchaser performs the test and the material fails to meet the requirement, the material may be subject to rejection.

11 Packing and Marking

11.1 Special packing requirements shall be subject to agreement between the supplier and purchaser. Otherwise all poly shall be handled, inspected, and packed in bags and boxes in such a manner as to minimize abrasion, chipping, and contamination, and in accordance with the best industry practices to provide ample protection against damage during shipment.

11.2 The poly supplied under the specification shall be identified by appropriately labeling the outside of each box and each bag therein. Identification shall include, as a minimum, the weight and lot number of the polysilicon. The lot number shall provide traceability to information concerning the manufacturing history of the particular poly in that lot. Such information shall be kept on file at the manufacturer's facility for at least three years after that particular lot has been accepted by the purchaser.

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