

ICS 29.045
CCS H 82



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 29055-2019

Replacing GB/T 29055-2012

Multicrystalline silicon wafers for photovoltaic solar cells

太阳能电池用多晶硅片

Issued on: June 4, 2019

Implemented on: May 1, 2020

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

Table of Contents

1	Scope
2	Normative References
3	Terms and Definitions...
4	Requirements...
5	Test Methods...
6	Inspection Rules
6.1	Inspection and Inspection Acceptance
7	Marking, Packaging, Transportation, Storage and Quality Certificate...
7.2	Packaging, Transportation and Storage
7.3	Quality Certificate
8	Order Form (or contract) Content

Foreword

This Standard was drafted in accordance with the rules in GB/T 1.1-2009. This Standard serves as a replacement of GB/T 29055-2012 Multi-crystalline Silicon Wafer for Solar Cell. In comparison with GB/T 29055-2012, apart from editorial modifications, the main technical changes are as follows:

---The scope of application is modified: "applicable to multicrystalline silicon wafers for photovoltaic solar cells produced by ingot multi-crystalline chips perpendicular to the direction of crystal growth" is modified into "applicable to casting multi-crystalline silicon wafers for photovoltaic solar cells (including monocrystalline silicon wafers)" (see Chapter 1; Chapter 1 in Version 2012).

---Normative references GB/T 1551 and SEMI MF 1535 are deleted; GB/T 30860, GB/T 30869; SJ/T 11627, SJ/T 11628, SJ/T 11630, SJ/T 11631, SJ/T 11632 and YS/T 28 are added (see Chapter 2; Chapter 2 in Version 2012).

---The definition of dense saw marks is deleted; the definition of saw marks and microcrack is added (see 3.1 in Version 2012).

---The classification of side length is modified from 125 mm 125 mm and 156 mm 156 mm into 156.75 mm 156.75 mm; it is recommended that the increase or decrease of the side length shall be integer multiples of 1 mm (see Table 1; Table 1 in Version 2012).

---The classification and requirements of dimensions are combined; the requirements for side length, thickness and allowable deviations are modified (see 4.1; Chapter 4 and Chapter 5 in Version 2012).

---The requirements for total thickness variation and curvature are modified (see 4.1; 5.2 in Version 2012).

---The requirements for carrier lifetime, interstitial oxygen content and substituted carbon content are modified (see

4.2.3 and 4.3; 5.3.3,

5.3.5 in Version 2012).

---The requirements for notches and microcracks are added to surface quality (see 4.4.1).

---The requirements for chipping defect are modified in surface quality (see 4.4.2;

1 Scope

China's national standard for the multicrystalline silicon wafers used to make photovoltaic solar cells. It specifies the requirements, the test methods, the inspection rules, the marking, packaging, transport, storage and quality certificate, and the content of the order form for cast multicrystalline wafers, including quasi-monocrystalline wafers. The wafer is where the photovoltaic industry's economics are decided. It is cut from a silicon brick by wire saw, and by the time it exists most of the cost of the finished module has already been incurred: the polysilicon, the casting, the bricking and the sawing. Everything downstream - the cell process, the module assembly - adds value to a wafer whose properties it cannot improve. So the wafer is bought on a specification, and the specification is unusually detailed for a piece of material a fifth of a millimetre thick. What matters divides into three. The electrical properties: the resistivity and its uniformity, the minority carrier lifetime, and the type and dopant, which set the ceiling on cell efficiency. The geometry: the thickness and its variation, the total thickness variation across the wafer, the bow and warp, the dimensions and the diagonal, all of which determine whether the wafer survives an automated cell line at all. And the surface and structural integrity: the saw marks, the microcracks, the chips and the contamination - a microcrack invisible to the eye breaks the wafer three process steps later, and a broken wafer in a furnace stops the line. The 2019 revision widens the scope to cast wafers including quasi-monocrystalline, replaces the definition of dense saw marks with definitions of saw marks and microcracks, and brings in the newer measurement standards for the properties concerned. Issued on 4 June 2019 and in force since 1 May 2020, it replaces GB/T 29055-2012.

This Standard stipulates the requirements, test methods, inspection rules, marking, packaging, transportation, storage, quality certificate and order form (or contract) content of multicrystalline silicon wafers for photovoltaic solar cells (hereinafter referred to as silicon

wafers). This Standard is applicable to casting multi-crystalline silicon wafers (including monocrystalline silicon wafers).

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 1550 Test Methods for Conductivity Type of Extrinsic Semiconducting Materials;

GB/T 2828.1-2012 Sampling Procedures for Inspection by Attributes - Part 1: Sampling Schemes Indexed by Acceptance Quality Limit (AQL) for Lot-by-lot Inspection;

GB/T 6616 Test Methods for Measuring Resistivity of Semiconductor Wafers or Sheet Resistance of Semiconductor Films with a Noncontact Eddy-current Gauge;

GB/T 6618 Test Method for Thickness and Total Thickness Variation of Silicon Slices;

GB/T 6619 Test Method for Bow of Silicon Wafers;

GB/T 14264 Semiconductor Materials - Terms and Definitions;

GB/T 29054 Casting Multicrystalline Silicon Brick for Photovoltaic Solar Cell;

GB/T 30860 Test Methods for Surface Roughness and Saw Mark of Silicon Wafers for Solar Cells;

GB/T 30869 Test Method for Thickness and Total Thickness Variation of Silicon Wafers for Solar Cell; SJ/T 11627 Online Test Methods for Resistivity of Silicon Wafers for Solar Cell; 6616.

5.7 The test of surface quality (apart from microcracks and saw marks) shall comply with the stipulations in SJ/T 11631, or, be determined by the demand-side and the supply-side through negotiation.

5.8 The test of surface microcracks shall comply with the stipulations in SJ/T 11632.

5.9 The test of surface saw marks shall comply with the stipulations in GB/T 30860.

5.10 The examination of the maximum grain area ratio of monocrystalline silicon wafers shall be conducted under the lighting conditions of 430 lx ~ 650 lx, through visual inspection at a distance of 30 cm ~ 50 cm away from the silicon wafers and vertical to the surface of the silicon wafers.

6.1 Inspection and Inspection Acceptance

6.1.1 Products shall be inspected by the supply-side, which shall guarantee that product

quality complies with the stipulations in this Standard and the order form (or contract). In addition, a quality certificate shall be filled out.

6.1.2 The demand-side shall inspect the received products in accordance with the stipulations in this Standard. When the inspection result does not comply with the stipulations in this Standard and the order form (or contract), this shall be proposed to the supply-side in the written form; settled by the demand-side and the supply-side through negotiation. Objections regarding dimensions or surface quality shall be proposed within 1 month upon receiving the products. Objections regarding other properties shall be proposed within 3 months upon receiving the products. If arbitration is needed, it shall be determined by the demand-side and the supply-side through negotiation.

6.2 Group Batch Silicon wafers shall be submitted for acceptance inspection in batches. Each batch shall be constituted of silicon wafers of identical production process, and the same dimensions, conductivity type and electrical resistivity range.

6.3 Inspection Items Inspection items of each batch of silicon wafers are shown in Table 3.

7.1.2 Silicon wafers shall be packed in boxes. The external side of each box shall indicate:

- a) Name and trademark of the supply-side;
- b) Name of product;
- c) Technical requirements of product;
- d) Quantity of Product;
- e) Marks or signs like "Handle with Care", "Keep away from Moisture", "Fragile" and "Number of Stacked Layers".

7.2 Packaging, Transportation and Storage

7.2.1 The packaging of silicon wafers shall comply with the stipulations in YS/T 28, or, it may be determined by the demand-side and the supply-side through negotiation.

7.2.2 During the transportation, silicon wafers shall be loaded and unloaded with care; throwing of silicon wafers is strictly prohibited. Do not squeeze silicon wafers. In addition, measures shall be adopted to prevent from vibration and moisture.

7.2.3 Silicon wafers shall be stored in clean and dry environment.

7.3 Quality Certificate

- a) Name of the supply-side;
- b) Name of product;
- c) Quantity of product;