ICS 27.160; 49.140
CCS F 12;V76

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 38200-2019

Measurement method for the quantum efficiency of solar cells

太阳电池量子效率测试方法

Issued on: October 18, 2019 **Implemented on: May 1, 2020**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

1 Scope
2 Normative references
3 Terms and definitions
4 Test purposes
5 Sample preparation and test conditions
6 Test principle

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard is proposed and managed by the National Aerospace Technology and its Application Standardization Technical Committee (SAC/TC425). This standard was drafted. Shanghai Space Power Research Institute, China Aerospace Standardization Institute. The main drafters of this standard. Yang Hongdong, Liu Zhi, Jiang Depeng, Chi Weiying, Lu Jianfeng, Ni Jiawei, Chen Guoling, Yan, Zhang Yiwei, Tan Xueyan, Xu Dongyan. Solar cell quantum efficiency test method

1 Scope

China's national method for measuring the quantum efficiency of solar cells. It specifies the conditions, the principles, the tests and the data processing. Quantum efficiency is the fraction of incident photons at a given wavelength that produce a collected electron, measured across the spectrum, and it is the diagnostic measurement of photovoltaics. An efficiency figure says how well a cell performs; the quantum efficiency curve says why. Loss at short wavelengths points to the front surface and the emitter, because blue light is absorbed within the first fraction of a micron; loss in the middle points to reflection or to the anti-reflection coating; loss at long wavelengths points to the bulk material and the rear surface, because red light penetrates deep and its carriers have furthest to travel. For anyone developing a cell rather than merely selling one, this curve is where the next improvement is identified, which is why the measurement needs standardising.

This standard specifies the conditions, principles, tests and data processing methods for solar cell quantum efficiency testing. This standard applies to the single-junction, multi-junction solar cell quantum efficiency test.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article. Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 2297-1989 Solar photovoltaic energy system terminology

3 Terms and definitions

The terms and definitions defined in GB/T 2297-1989 apply to this document.

4 Test purposes

The solar cell quantum efficiency obtained by the method given in this standard can be used to characterize the photo-generated carrier capacity and device structure of solar cell devices.

5 Sample preparation and test conditions

Sample preparation and test conditions are as follows:

a) The device under test shall be stable and shall not undergo performance changes due to illumination;

b) environmental pressure. atmospheric pressure;

c) Sample test temperature. 25 ° C ± 2 ° C.

6 Test principle

Irradiating a solar cell with monochromatic light of different wavelengths, when the photon energy is greater than the corresponding band gap width of the solar cell material, the electricity is excited Sub-hole pairs; when a circuit is formed externally, the photo-generated carriers form a current. Solar cell quantum efficiency is defined as a certain wave Long incident photons produce the number of electron-hole pairs in the outer circuit. Then the amount of solar cells under the photon irradiation of the incident light wavelength lambda The sub-efficiency EQE(lambda) can be expressed as equation (1). EQE(lambda)= Phi(lambda) (1) In the formula. Phi(lambda)

---the photon flux of incident light per unit area, in joules (J); n

--- The number of photogenerated carriers per unit area. It can be calculated by equation (2). n= Jph (2)