

摘要： 为了实现对太阳能电池可靠性的筛选分类,建立了一套低频噪声自动测试系统。首先,根据太阳能电池1/f噪声的来源,确定了在大电流密度情况下以1/f噪声功率谱作为太阳能电池可靠性指示的可行性。然后,由测试得到的功率谱曲线明确了通过比较在f为1 Hz频点处的1/f噪声功率谱值大小可以区分太阳能电池的可靠性。最后,根据半导体器件可靠性试验验证的分类标准,给出了确定筛选阈值的方法。实验结果表明:该方法可以在短时间内无损地完成一批太阳能电池3个等级的可靠性分类,平均每个太阳能电池的测试时间只需5 min。采用该筛选方法,能精确检测单一器件,解决了传统方法花费大、周期长,易引起器件的损伤,且只能得到一批器件可靠性的统计规律的问题。该方法适用于对太阳能电池可靠性要求高的应用场合。

关键词： 太阳能电池 1/f噪声 可靠性 筛选方法

Precise measurement of 1/f noise and its application to reliability screening for solar cells

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Abstract: An automatic measurement system for low frequency noises is established to sort solar cells according to their reliability. First, according to the sources of the 1/f noise of a solar cell, this paper identifies the feasibility of 1/f noise under big current density to be the reliability indication of the solar cell. Then, according to the noise spectral character measured by the automatic measurement system, it points out that comparing the 1/f noise spectrum of different solar cells in f at 1 Hz is an effective method to distinguish the reliability of different solar cells. Finally, the method to determine the threshold of screening solar cells is given based on the standard of semiconductor device quality classification. Experimental results indicate that this kind of method can nondestructively sort the solar cells into three groups according to their reliability, and spends only 5 min for measuring single solar cell. The proposed method can detect every single solar cell correctly and has advantages over traditional methods in costs, time and hard to be hurt. This method can satisfy the application requirements of screening solar cells for high reliability.

Keywords: solar cell 1/f noise reliability screening method

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