

光伏背板用 KPK 绝缘封装材料局部放电特性研究

摘 要

由于全球对电力需求的增长,以及化石燃料的日益匮乏和人类环保意识的增强,光伏发电产业在近些年来发展迅速。作为光伏发电系统的关键部件,光伏组件直接决定了光伏发电系统长期运行的可靠性。而背板作为保护光伏组件的第一道屏障,其绝缘性能对于整个光伏发电系统安全运行都是尤为重要的。由于高分子材料的发展,PVDF(聚偏氟乙烯)因其含有碳-氟键等特点,逐渐大量应用于光伏背板中。由PVDF膜所制作而成的KPK型背板因其具有成本优势和良好的物理性能,开始在光伏发电系统中得到广泛的应用。但在高电压条件下,KPK型背板会出现局部放电现象,使得光伏发电系统的绝缘系统被破坏,进而引起一系列不必要的经济损失。因此,对KPK型背板的进行局部放电特性研究具有十分重要的实际意义。

为此,本文基于脉冲电流法搭建了局部放电试验平台,然后对样品进行预处理,最后在在室温条件下对KPK型背板样品分别放电30min、60min和120min。通过对试验数据进行处理,绘制局部放电相位分布图谱(PRPD),分析研究了KPK型背板的局部放电特性。本文为下一步分析光伏背板绝缘失效及老化机理,延长背板使用寿命,提供了参考价值。

关键词: 光伏组件; 局部放电; KPK型背板; 局部放电相位分布图谱

ABSTRACT

Due to the increasing global demand for electricity, the increasing shortage of fossil fuels and the growing awareness of environmental protection, the photovoltaic power generation industry has developed rapidly in recent years. As a key component of photovoltaic power generation system, photovoltaic modules directly determine the long-term operation reliability of the system. As the first barrier to protect photovoltaic modules, the insulation performance of the backsheet is particularly important for the safe operation of the entire photovoltaic power generation system. Due to the development of polymer materials, PVDF (polyvinylidene fluoride) has been widely used in photovoltaic backsheets due to its carbon-fluorine bond and other characteristics. Because of its cost advantage and excellent physical performance, KPK backsheets made of PVDF membrane have been widely used in photovoltaic power generation systems. However, under the condition of high voltage, the KPK backsheet will show partial discharge phenomenon, which will damage the insulation of the photovoltaic power generation system, thus causing a series of unnecessary economic losses. Therefore, it is of great practical significance to study the partial discharge characteristics of KPK backsheets.

For this reason, this paper built a partial discharge test platform based on pulse current method, and then pretreated the samples. Finally, the KPK backsheet samples were discharged for 30min, 60min and 120min respectively at room temperature. By processing the test data, drawn the phase resolved partial discharge distribution pattern (PRPD), and the partial discharge characteristics of KPK backsheets are analyzed and studied. This paper provides reference value for the further analysis of insulation failure and aging mechanism of photovoltaic backsheets, and prolonging its service life.

Keywords: Photovoltaic modules; Partial discharge; KPK backsheet; Phase resolved partial discharge

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