

光纤Bragg光栅温度传感器在硅橡胶绝缘子温度特性研究中的应用

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摘要:

伴随着运行时间的增长, 硅橡胶绝缘子逐渐出现发热和老化的问题。为了实时检测硅橡胶绝缘子的工作温度, 将光纤Bragg光栅温度传感器分别安装于硅橡胶绝缘子的金属棒上、下两端和伞群部分。在15kV工频电压作用下, 硅橡胶绝缘子温度发生变化, 从而使得安装于硅橡胶绝缘子上的光纤Bragg光栅温度传感器中心波长产生相应的移位。温度特性实验表明: 金属棒上、下两端和伞群部分在无污染情况下温升分别为1.8℃、2.1℃和0.5℃; 在凝露情况下温升分别为2.3℃、2.7℃和0.7℃; 在II级污秽等级情况下温升分别为3.5℃、4.1℃和0.9℃; 破坏后的伞群部分在三种情况下的温升分别为4.9℃、5.5℃和7.1℃。光纤Bragg光栅温度传感器可有效的检测硅橡胶绝缘子的工作温度, 反映硅橡胶绝缘子的实时工作状态。因此光纤Bragg光栅温度传感器可满足硅橡胶绝缘子温度特性的实时在线监测要求。

关键词: 温度测量; 光纤Bragg光栅; 温度传感器; 硅橡胶绝缘子

Temperature Characteristics Research of Silicon Rubber Insulator by Using Fiber Bragg Grating Temperature Sensors

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Abstract:

Along with the growth of running time, silicone rubber insulators will gradually heat and age. In order to reflect the working state of silicon rubber insulator, the optical fiber Bragg grating temperature sensors are installed respectively on the top and bottom of the metal bar and umbrella group of silicon rubber insulator. Under the effect of 15 kV frequency voltage, the temperature of silicon rubber insulator will be changed, which makes the center wavelength of the optical fiber Bragg grating temperature sensors shift. Temperature characteristics experiments show that the temperature of three parts respectively rise 1.8℃, 2.1℃ and 0.5℃ in pollution-free case, 2.3℃, 2.7℃ and 0.7℃ in gel case, 3.5℃, 4.1℃ and 0.9℃ in level II filthy case. The temperature of the destroyed umbrella group respectively rise 4.9℃, 5.5℃ and 7.1℃ in three cases. The working temperature of silicon rubber insulator can be detected effectively by using fiber Bragg grating temperature sensor to reflect the real-time work status of silicone rubber insulator. Therefore, the optical fiber Bragg grating temperature sensor can meet the requirement of real-time online monitoring.

Keywords: temperature measurement; fiber Bragg grating(FBG); temperature sensor; silicon rubber insulator

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