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A comparative study of DC and AC inclined plane tests on SiR micro-composite insulators

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ABSTRACT

Presently, there is no test on evaluating the tracking and erosion resistance of DC polymeric insulators under contaminated conditions. Often researchers use a modified version of the widely used AC inclined plane test to evaluate the tracking and erosion resistance of DC polymeric insulators. The results obtained from these modified tests thus far have not been conclusive and show various inconsistencies. This research report presents results obtained from an experimental procedure of inclined plane tests of silicone rubber (SiR) insulation at 3.5 kV and 4.5 kV positive DC and AC using intravenous (IV) system as pollutant supply mechanism. The leakage currents were recorded for the duration of each test. In addition, physiochemical tests such as Fourier transform infrared (FTIR) analysis, Thermo-gravimetric analysis (TGA), scanning electron microscope (SEM) and energy dispersive spectroscopy (EDS) were performed on aged and un-aged samples. The findings are that the DC leakage current on the surface tracking activity is bigger (about 2 times) than that under AC for the same equivalent voltages. Furthermore, DC leakage current variations are less random and the average current increases with duration of voltage application compared to AC which doesn't increase with time. The inclined plane test results of 3.5 kV AC and DC are comparable as deduced from the physiochemical analysis of the test samples. Finally, the failure criteria under DC inclined plane test should only be the leakage current being less than 60 mA and should exclude the tracking length criterion as this would not apply for DC.