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Research on the pollution performance and degradation of superhydrophobic nano-coatings for toughened glass insulators

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Abstract-

Most of the research efforts to enhance the pollution performance of glass insulators have been focused on room temperature vulcanizing (RTV) silicone rubber coatings to cover the original hydrophilic surface of glass with a hydrophobic polymeric one. However, in recent years, advanced superhydrophobic nano-coatings, with intrinsic self-cleaning properties, have been developed as a possible alternative to silicone. This paper presents a research carried out in an outdoor test station, where one insulator string composed of nano-coated glass insulators was monitored for over two years and its performance compared with other identical insulator strings, but composed by RTV silicone-coated and non-coated glass insulators. The test station was located in a heavily polluted area of France and the insulator strings were energized at transmission voltage level to represent real operational conditions. The pollution performance and degradation were investigated through leakage current analyses and quarterly visual inspections of the superhydrophobic surface. The results showed that the superhydrophobic nano-coating was only effective when it was new and during a short period of time. Later on, it was subjected to a gradual degradation resulting in a loss of hydrophobicity until reaching a steady hydrophilic condition.

Index Terms- Glass insulators; Leakage curren; Nano-coatings; Pollution flashover

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