Surface Fluorinated Polymeric Insulation for High Voltage DC Application

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Charge accumulation under high voltage DC is a major issue as its presence distorts the electric field, leading to premature failure. We aim to chemically treat polymeric insulation and change charge transport characteristics of the material via fluorination process. In doing so, exceptional surface properties similar to fluoropolymers can be achieved without compromising the bulk characteristics of the original polymeric insulation. The modifications in chemical components at the surface of polymeric insulation should in turn lead to corresponding modifications in electrical properties of the surface and suppress the charge accumulation.

Various fluorinating conditions will be experimentally investigated and the fluorinated samples will be electrically characterised and tested, so an optimal processing condition can be achieved to meet practical requirements as DC insulating material. Modelling and simulation of electric field distribution with new developed insulating material have been planned to help design an insulation spacer in high voltage DC GIS systems.

In this present project, fluorination of epoxy resins were carried out to suppress charge accumulation and consequently enhance flashover voltage. A surface flashover experiment using a pair of finger electrodes has been developed for this purpose. The electrodes are placed firmly on top of fluorinated epoxy sample as illustrated in Figure 1. The distance between the two electrodes is 8mm apart and they are connected to a 200kV high voltage power supply. The voltage is ramped up until the sample underwent a flashover. Identifying the flashover voltages of fluorinated epoxy samples against the controlled non-fluorinated sample will help to determine the effects of fluorination modification on enhancing the electrical properties at the surface of polymeric insulation.