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INFLUENCE OF THE CONCENTRATION ON SURFACE FLASHOVER OF THE EPOXY INSULATOR UNDER LIGHTENING IMPULSE VOLTAGE IN C4F7N-CO2 MIXTURES

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In recent years, alternative insulating gas of SF6 becomes a research hotspot in electric power system. The insulation performance of C4F7N is 2.2 times more than that of SF6, and its global warming potential is low. Its mixture gas with CO2 has the potential to replace SF6 gas. As a medium for gas-insulated equipment, it is of great engineering significance to study the surface flashover characteristics at different types of voltages. However, the flashover performance in this mixture gas is rarely studied.

In this paper, the surface flashover experiment platform is built and PR equation and Antoine equation are used to establish the mixing method and calculates the liquefaction temperature. The influence of C4F7N concentration under positive and negative lightning impulse voltage in uniform electrical filed is studied with the gas pressure changes from 0.1MPa to 0.3MPa. The creepage distance of the tested epoxy insulators is 10mm. The results are also compared with the data of the sureface flashover characteristics in C4F7N-CO2 mixtures under ac voltage.

Results show that small quantities of C4F7N mixed in CO2 can obviously promote the surface flashover voltage but, as the fraction of C4F7N increases, the surface flashover voltage saturates. When the molar fraction of C4F7N is 13%, the surface flashover voltage of C4F7N/CO2 gas mixture can reach more than 90% of that of pure SF6 under the same conditions. Moreover, the flashover voltages of insulators under different types of voltages are arranged as follows: positive lightning impulse voltage(LI+) > power frequency voltage(AC) > negative lightning impulse voltage(LI-).

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