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Influence of Impulse Waveform Parameters on the Breakdown Voltage in SF6 Highly Inhomogeneous Electric Field

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Very fast transient overvoltages(VFTOs) generated during the routine operations of disconnector switch in GIS make great threat to the insulation of power equipment such as GIS. So far, the research results of the insulation characteristics of GIS under VFTO have big dispersion and poor comparability for the waveform parameters of VFTO have not been standardized. A generating system of double-exponential impulses with front times in the range of 0.08˜1.2 μs and wave tail times in the range of 1.5˜50 μs was established to simulate VFTO. Using this impulse generator, the influence of impulse wavefront and wave tail time on the breakdown voltage in SF6 highly inhomogeneous electric field was studied. The results show that with the rise of gas pressure, the hump phenomenon occurs in the U50% - P curves. With the increase of impulse wavefront time, the 50% breakdown voltages change significantly and the U50% - Tf curves tend to be U-shaped. The bigger of the electric field factor f is, the obvious of the U-shaped trend is. Meanwhile, the 50% breakdown voltages decrease significantly with the increase of impulse wave tail time. Analysis reveals that the reasons for the phenomenon above may be explained by the differences of the migration and diffusion of space charges and discharge time delay under impulses with different waveform parameters.

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