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2P53 - The Influence of Electrode Profile on Repetition Performance of Corona-stabilized Switch

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Gas-discharge closing switches usually have more poor repetition performance than semiconducting switches. This is due to the recovery of gaseous insulation takes a lot of time, and can restrict the use of the gas switch in repetitive applications. The corona-stabilized switch is a potential plasma closing switch that has excellent PRF (pulse repetition frequency) capability. The electric field inhomogeneity of the switch is considered to have an important influence on the stabilization effect of corona plasma. In this paper, effects of electric field inhomogeneity on recovery rate and repetition performance of gaseous insulation are studied.
A double-pulse power supply, which is capable of generating two continuous voltage pulses with adjustable voltage amplitude and interval time, is used. A corona-stabilized switch with a single rod-plane electrode and gaseous medium of SF6 is investigated. Recovery rate of gaseous insulation in switch is obtained by comparing the breakdown voltage of the first pulse to that of the second at different pulse intervals (from 20μs -1s). Several rod electrodes are tested and the results are compared. Repetition performance under different electric field inhomogeneity is investigated by a repetition rate pulse generator. Charging and breakdown waveforms under a continuous repetitive mode are recorded. The repetition performance of the switch can be indicated by divergence of breakdown voltage. The results are explained by calculating corona critical volume under different electrode profiles. Further, physical model of corona stabilization at negative impulse in SF6 are proposed to help one to better understand the breakdown and recovery characteristics of electric field inhomogeneity dependence, relates the spatial extension of the corona plasma in an inhomogeneous field gap to the inhomogeneity of electric field. The trend of breakdown voltage according with pulse number indicates the relationship between electric field inhomogeneity and cumulative effect that result from continuous repetitive gas-discharge discharge.

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