MULTICHANNEL DISCHARGE CHARACTERISTICS IN SF_6-N_2 AND SF_6-Ar GAS MIXTURES UNDER NANOSECOND PULSES*

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Multichannel discharge in gas spark switches is an effective approach for the reduction of switch inductance, switch resistance and electrode erosion, and the increase of switch lifetime and stability. Although the dielectric strength of pure SF_6 is high, multichannel is difficult to form in discharge process in switch gap due to its strong electronegativity. Some researchers have found that multichannel will be easier to form in SF_6-N_2 gas mixture than in pure SF_6. However, until now it is unclear that which kind of gas mixtures can achieve the best multchannel discharge characteristics as well as maintaining fairly high dielectric strength. In this paper, experimental study was carried out to ascertain the variation of mixture ratio of SF_6-N_2 and SF_6-Ar on multichannel discharge characteristics in a coaxial field-distortion gas switch. In the experiments, the pressure varied from 0.1 to 0.2 MPa, the voltage pulse peak applied to the switch was in the range of 40 to 78 kV, and the rise time was 11 ns. The static breakdown strength of the gas switch was also tested. The results show that the average number of discharge channels increases in general with the increase in the content of argon or nitrogen, however, the average number of channels almost keeps constant as the gas mixture ratio varies when voltage rise rate is high enough. The static breakdown strength decreases slightly as the content of Argon or nitrogen increases. Selection of gas mixtures should make compromise between the multichannel formation and the gas dielectric strength.

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