OVERVOLTED BREAKDOWN AND RECOVERY CHARACTERISTIC OF SPARK GAP SWITCH

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Because of higher hold-off voltage and higher current than power semiconductor such as GTO、MOSFET、PCSS、SOS etc., spark gap switches are generally used in the last output stage of high power modulator[1]. But its recovery time is millisecond level, so it is prevented on the high rep-rate conditions. The gaseous recovery in a spark gap was investigated by using Two-pulses method with which the tested spark gap was broken down twice by two identical voltage pulses with a preset time interval in between[2]. While the first breakdown is overvolted breakdown, the second breakdown happens usually at a voltage much lower than the first one. By comparing the two breakdown voltages the gaseous recovery as a function of the time interval between the two voltage pulses was obtained. There are two plateaus on the curve of the breakdown voltage recovery. The first plateau appears at the voltage of about the DC static breakdown and the second one appears when the gas is almost fully recovered. It was found that the shorter gaps at all nitrogen pressure tend to recover faster and the gaps with higher pressure also tend to recover faster. If more energy is deposited in the spark channel produced by the first breakdown, the gas insulation recovers slower. Both the first breakdown voltage and the second one obey Gaussian distribution. If the second breakdown happens at the point before the end of the first plateau on the curve of the breakdown voltage recovery, its mean square deviation of the breakdown voltage distribution will be smaller than that of the first breakdown. By taking photographs of the discharge in the spark gap, it was important to find that the spark channel produced by the second breakdown usually does not follow that by the first breakdown. The second spark channel is located with a distance of 0 ~ 3 mm from the first one. The longer is the time interval between the two voltage pulses, the larger is the distance.

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