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Electro-thermal aging law of epoxy resin under bipolar exponential decay pulse voltage

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Epoxy resin of saturable reactor for UHVDC converter valves works in high temperature condition for longterm, and it also suffers from bipolar exponential decay pulse voltage erosion. In order to study the electrothermal aging law of epoxy resin, the electro-thermal aging tests under pulse aging and sinusoidal aging are carried out. Pulse aging voltage is set as bipolar exponential decay pulse with amplitude of 4.5kV, repetition rate of 50Hz, positive rise time of 1.2us, positive width of 12us, negative rise time of 24us and negative width of 74us. Sinusoidal aging voltage is set as sinusoidal voltage with amplitude of 4.5kV and repetition rate of 50Hz. Aging temperature is set as 110 degrees centigrade. Aging time is set as 20h to 140h with a step length of 20h. The results show that with the increase of aging time, the dielectric constant and dielectric loss tangent value of epoxy resin increase obviously in the 10-1⁻¹103 Hz frequency range, and the aging degree of pulse voltage is lower than that of sinusoidal voltage. Therefore, the margin of the design according to the sinusoidal voltage aging is higher than that according to the bipolar pulse voltage under normal operating conditions.

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