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Thu-Mo-Po4.03-07 [18]: A Novel Diagnosis Method through Pulse Sequence Analysis of DC Void Partial Discharge in High Temperature Superconducting Cable

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In an HVDC high-temperature superconducting (HTS) cable composed of polypropylene laminated paper (PPLP), a butt-gap which is unavoidable in the fabrication process may lead to form voids. When dc voltage higher than partial discharge inception voltage (PDIV) is applied, partial discharge occurs in the void. If void discharge sustains, the electrical ageing of PPLP accelerates, and eventually dielectric breakdown may occur due to the lowering of dielectric strength. Therefore, for reliable insulation design and maintenance of HVDC HTS cable, insulation diagnosis technology is required. Since there is phase information in the AC voltage, defect identification and diagnosis in the HVAC HTS cable are performed through ac partial discharge measurement and Phase Resolved Partial Discharge (PRPD) pattern analysis. However, since there is no phase information in the DC voltage, insulation diagnosis using PRPD is impossible. Therefore, for the insulation diagnosis of the HVDC HTS cable, the DC partial discharge pattern analysis technique using the Pulse Sequence Analysis (PSA) method is required. Consequently, in this paper, to suggest the insulation diagnosis method for void defects of the HVDC HTS cable, void partial discharge was measured according to the size of void and magnitude of applied voltage. Also, patterns of the void partial discharge were obtained using PSA method and PYTHON program. From the experimental results, although the magnitude, time difference and repetition rate of partial discharge are different depending on the configuration of the void and the applied voltage, it is confirmed that the patterns of partial discharge have similar shapes. Therefore, it is considered that insulation diagnosis for void defects in HVDC HTS cable is possible through the obtained DC void partial discharge patterns.

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