

Partial discharge in nanofluid insulation material with conductive and semiconductive nanoparticles

ABSTRACT

This study provides a thorough investigation of partial discharge (PD) activities in nanofluid insulation material consisting of different types of nanoparticles, which are conductive and semiconductive when subjected to high voltage stress is presented. Nanofluids have become a topic of interest because they can be an alternative to liquid insulation in electrical apparatus due to their promising dielectric strength and cooling ability. However, during in-service operation, PDs can occur between conductors in the insulation system. Therefore, this study presents the behavior of PDs within nanofluid dielectric materials consisting of conductive and semiconductive nanoparticles. The results show that there is an improvement in the PD resistance and a reduction in the tan delta of nanofluids at power frequency after the incorporation of conductive or semiconductive nanoparticles in the nanofluid oil. However, the most suitable concentration of conductive and semiconductive nanoparticles in the base fluid was found to be, respectively, 0.01 g/L and 1.0 g/L at PD inception and PD steady-state conditions. The clustering of nanoparticles in a nanofluid suspension due to PD activities is also discussed in this study