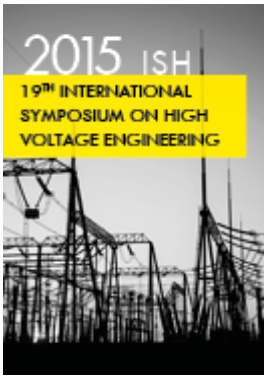
Reference: **ISH2015_351**



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Analysis of dielectric properties of refrigerants R134a and R227ea

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Abstracts

In order to increase the power density of electrical equipment the direct cooling of live parts by using refrigerants is a possible solution. R134a and R227ea are two refrigerants which are widely used due to their favourable low vapour pressure characteristics. In this study they are analysed concerning their dielectric strength and their discharge behaviour. The dielectric strength is measured by using an arrangement of two hemispherical electrodes according to DIN EN 60156. Hereby the electrode arrangement is housed by a transparent pressure proof vessel. While the temperature during the measurements remains constant the pressure is varied between 0.1 MPa and the liquefaction pressure of R134a and R227ea, respectively. The cooling agents are stressed by a power frequent AC voltage which is increased continuously until breakdown. In the gaseous phase R227ea exhibits a significantly higher dielectric strength than R134a. Due to its high dielectric loss factor in the order of 10 the application of an electrical field leads to a marked energy dissipation in liquid R134a. At low field strengths the heat generated between the electrodes is dissipated by natural convection. However, if the electrical field strength exceeds a certain limit massive formation of bubbles takes place. The analysis of the data shows that the breakdown strength of the liquid corresponds to the values obtained in the gaseous phase. In addition, it can be observed that during the breakdown process carbon black is produced which disperses quickly in the liquid.