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Title: Influence of mechanical pressure on space charge penetration behaviour in low-density polyethylene (LDPE) sheet.

Authors: A.I. Mohamed, R. Ozaki and K. Kadowaki

Space charge penetration into bulk of cable insulation is known as the cause of insulation breakdown thus affecting the cable power delivery capability. Penetration of packet-like positive space charge enhances local field and when the field increases up to 5MV/cm before breakdown occurs. Exactly before the breakdown occurs, space charge penetration seems stagnant as it is prevented to penetrate further into cathode. During this time, coulomb force is generated. This force is assumed to press the free volume of the insulation thus reducing the size of the free volume itself. In this paper, the behaviour of space charge under artificial pressure is discussed. A pulsed-electroacoustic (PEA) equipment capable to press the sample up to 5 tonne is developed in order to carried out this study. Sample used in this study is a 150um low-density polyethylene (LDPE) sheet. The sample is stressed with positive dc voltage so that the mean applied field is equal to 1.5MV/cm. The range of pressure applied to the sample is from 0MPa and 32MPa. Preliminary test is carried out to measure the reduced-thickness of the LDPE sample when pressure (0MPa to 32MPa) is applied. The voltage will be applied to the sample so that the field would be equal to 1.5MV/cm. From the result, sample with 0MPa shows the highest positive space charge penetration. The penetration gradually reduces with the increase of pressure. Sample pressed with 32MPa show the least penetration depth as little as 5% of the sample thickness. As a comparison, space charge penetration of sample with 0MPa pressure is as depth as 85% of the sample thickness. This shows that space charge penetration is restricted when sample is pressed. The result obtained shows that it need at least 24MPa to suppress space charge penetration. However, the calculated pressure produced by the electrostatic force under dc high field does not in agreement with the result. At 5MV/cm, the calculated pressure generated is only 1.1MPa which is significantly small compares to experimental value at 24MPa. Therefore, further work is needed to understand this interesting phenomenon.