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INFLUENCE OF THE DENSITY INCREASING OF CLOSE LOCATED WATER MICRO-INCLUSIONS ON ELECTROPHYSICAL PROCESSES IN NONLINEAR SOLID DIELECTRIC

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Abstract

Some features of the electro-physical processes that arise in solid dielectric media with the presence of water under the action of strong electric fields are determined. On the example of cross-linked polyethylene insulation of superhigh-voltage cables, the amplifications of the electric field, the increase in current densities and the rise of surface forces in the local regions of the insulation with increasing density of close located water micro-inclusions are calculated. Using the developed mathematical model on the basis of the finite element method, the dependences of the abovementioned values on the number and mutual distances between

inclusions are determined. It is demonstrated that the fragmentation of micro-inclusions (i.e. an increase in their number with an unchanged total volume of water) increases the stressed volume of the dielectric, as well as the number of areas with increased field strength and pulsating forces. An increase in the field disturbance can also be caused by a change in the configuration of a set of close located inclusions, in particular, with a decrease in the distances between them. The fragmentation of micro-inclusions is dangerous process for a dielectric, since it can lead to further combining the fragmented micro-inclusions into a single conducting structure along the field and results in irreversible degradation of the dielectric. References 12, figures 3.

Key words: electric field, XLPE insulation, superhigh-voltage cable, water micro-inclusions, electric current, surface forces, stressed volume.

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