RESEARCH OF DIELECTRIC PROPERTIES DEPENDENCE OF NEW ELECTRICAL INSULTAING MATERIALS ON RADIATION EXPOSURE

Romanov[1] B. S., Kostromin[1] V. V., Bedenko[2] S. V., Mukhnurov[2] I. A., Román Matías[2] R.
Scientific adviser: Bedenko[2] S. V., Ph.D. Physics, docent
[1]Special Design Bureau for Cable Industry, JSC Mytishchi, Russia
[2]National Research Tomsk Polytechnic University, Tomsk, Russia
E-mail: sbyt@okbkp.ru

To provide reliability and safety of operation of nuclear power plants (NPP) at the present time there is the need for developing special wires and cable products on the basis of materials which could provide their continuous exploitation in ionizing radiation fields and at increased temperatures [1].

It is evident that selection of materials should follow the selection of materials not only in terms of the analysis of their electrophysical, physical and mechanical and processing properties, but also taking into account changes of these properties caused by long-term exposure and temperature [2].

When NPP, engineering systems and installations operate in specific conditions materials of different chemical nature are used (metals, semiconductors, polymers, etc.). The mechanism of radiation effect on different materials is not similar. Taking into account that it is difficult to find a universal approach to the description of radiation effects in various materials it makes sense to consider radiation exposure on separate groups of materials combined either by their chemical nature or by the application field.

Polymer materials are widely used in various engineering fields, including nuclear industry, where they are influenced by ionizing radiation of different activity. Radiation effects in such materials are determined not only by the absorbed radiation dose, but also by a number of other factors (for example, the radiation spectrum) specifying irradiation conditions.

Hundreds of works were devoted to the study of irradiation specificity influence on polymers properties. However, in many cases additional researches and experiments on the resistance to factors present in certain conditions are required.

One of such materials is PTFE-4MB (F-4 MB) developed as early as 1970. Working capacity of this material for special-purpose wires and cables was supported by numerous tests carried out in terms of scientific and design and experimental researches [3]. But its modification PTFE-4 MB of K-series (F-4 MBK) suggested by Plastpolymer Joint Stock Company is practically unstudied.

The study of external impact on the properties of F-4 MBK has some academic and practical interest and is the purpose of the present research.

The influence of gamma radiation on dielectric (ε and tgδ) and physical mechanical properties of PTFE-4 MBK is considered. Research of radiation influence on relative dielectric permittivity ε and dielectric loss tangent tgδ allows predicting cable products properties applied in various conditions and developing exploitation reference documentation. The results of the research will be used for reasoning and locating cables and wiring in engineering systems and installations creating ionizing radiation fields.

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