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BOOK OF ABSTRACTS

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One numerical method for determining the absorbed dose of gamma and X radiation in the ZrO_2 dielectric within the MOS capacitor

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At present, advanced microelectronics devices with Metal-Oxide-Silicon (MOS) structures are used to improve the functional characteristics of devices used in nuclear technology, radiation dosimetry and radiation protection in aerospace engineering, nuclear industry and radiotherapy equipment. Among other things, it is often the goal of new research to find new materials for the dielectric oxide such as of zirconium oxide (ZrO2) with higher dielectric constant (high-k) and testing its characteristics in an environment with radioactive radiation. The paper presents the application of a numerical method for the determination of the absorbed dose of gamma and X radiation in the dielectric thin layer of zirconium oxide, which is located in the structure of the MOS capacitor. The relation on the basis of the numerically calculated absorbed dose of radiation is obtained by using the theory of the physical transport of photons in a thin layer of dielectric. In doing so, it is necessary to know the spatial dependence of the photon flux of gamma or X-ray in a volume of the dielectric, as well as the values of the total mass attenuation coefficient and total energy absorbed mass coefficient for ZrO2 as a radiation characteristic of the material from which is made a dielectric. Based on the results of our research, it can be concluded that ZrO2 has satisfactory radiation characteristics as an alternative to the selection of dielectrics in MOS structures that are incorporated in dosimeters and radiation monitors.

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