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BOOK OF ABSTRACTS

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RADIATION CHARACTERISTICS FOR HfO_2 AND SiO_2 INCORPORATED IN ELECTRONIC COMPONENT WITH MOS STRUCTURE IN FIELDS OF GAMMA AND X-RADIATION

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The advancement of new techniques for detection of ionizing radiation requires the development of electronic components, which in their structure have new materials with improved radiation characteristics. In recent years, modern semiconductor MOS structures were designed with a silicon dioxide (SiO_2) as the selected material. Such Metal- SiO_2 -Si structures have proven to be very suitable for the production of basic components for detection and dosimetry in the fields of gamma and X-radiation. In this paper we will consider the possibility of using hafnium dioxide (HfO_2) as a new material that could be used in semiconductor technology instead of silicon dioxide (SiO_2). Basic radiation characteristics for HfO_2 and SiO_2 are determined using XCOM software (NBSIR 87-3597), whereby total cross sections and attenuation coefficients as well as partial cross sections for the following processes are defined: incoherent scattering, coherent scattering, photoelectric absorption, and pair production in the field of the atomic nucleus and in the field of atomic electrons. Finally, a presentation of one type of numerical calculation of the transport of gamma and X radiation through a MOS capacitor, consisting of an aluminum electrode, HfO_2 gate dielectric on p-type silicon ($\text{Al}/\text{HfO}_2/\text{pSi}$) was made. The conclusions reached are of particular importance in cases where a compromise between the improvement of electrical and radiation characteristics is achieved.



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