NUCLEAR RADIATION DETECTORS BASED ON HIGH QUALITY 4H-SiC SEMICONDUCTOR

Hrubčín L.[1,2], Zaťko B.[1], Boháček P.[1], Rozov S.[2], Sandukovsky V.[2], Ivanov O.[2], Semin V.[2], Mitrofanov S.[2], Skuratov V.[2], Gurov Yu. [2,3]

[1] *Institute of Electrical Engineering, Slovak Academy of Sciences, Bratislava, Slovak Republic;* [2] *Joint Institute for Nuclear Research, Dubna, Russia;*
[3] *National Research Nuclear University (MEPhI), Moscow, Russia*
E-mail: ladislav.hrubcin@savba.sk

SiC (silicon carbide) is a promising material for radiation-tolerant electronics, high-temperature electronics and high-frequency and power devices. 4H-SiC is polytype with the electron saturation drift velocity of $2 \cdot 10^7$ cm/s and the breakdown voltage of $2 \cdot 10^6$ V/cm at room temperature. This material is also a very good candidate as a material in radiation detection [1, 2]. The band gap energy of 4H-SiC is 3.26 eV and the mean energy of electron-hole pair creation is 7.78 eV. Detectors based on the 4H-SiC epitaxial layer can attain a good spectrometry of *X*-rays at room and also at elevated temperatures.

Detector structures [3] were prepared from a 70 μm thick nitrogen-doped 4H-SiC layer (donor doping $\sim 1 \cdot 10^{14}$ cm^{-3}) grown by the liquid phase epitaxy on a 3" 4H-SiC wafer (donor doping $\sim 2 \cdot 10^{18}$ cm^{-3}, thickness 350 μm). The Schottky barrier contact (Au/Ni with thicknesses 30 and 10 nm) with diameter of 2.0 mm was formed on the epitaxial layer through a contact metal mask, while full area contact from Ti/Pt/Au was evaporated on the other side (substrate).

At the IC-100 cyclotron of the Joint Institute for Nuclear Research, there is a relative quick degradation of Si detectors under impact of the high-energetic beam of heavy ions of xenon. Except this fact, there is a second effect connected with the pulse response of detector to heavy ions, which is different than that for light ions. In detail, the pulse height is lower for heavier ions. This effect is known in the literature as Pulse Height Defect (PHD) [4] and it was studied by us, too.

In our paper, we describe a new approach in which is possible to direct measure of the continual deteriorate of the parameters of detectors under Xe ions, that also included the first utilise of SiC detector for practical experiment at IC-100 cyclotron [5].

Besides this, in this paper we present the method of the observing of PHD effect at IC-100 cyclotron, when 4H-SiC and Si detectors were irradiated by the high-energetic beam of heavy ions of Xe [6].

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