Electrical Properties Study of the 4H-SiC Detectors Based on Thick Epitaxial Layer

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Abstract. During the last decade, the technology for the production of high quality SiC material has improved enough to create epitaxial layer suitable for the preparation of semiconductor detectors for ionizing radiation. The 4H-SiC epitaxial structures from two different suppliers and of different quality were used for the preparation of the detectors. The structures from CREE/Wolfspeed (#USA) have the impurity concentration of about 2×10^{14}cm^{-3} and layer thickness of 100 μm, while those from LPE (#IT) exhibit lower impurity concentration of about 7×10^{13}cm^{-3} and their epitaxial layer thickness was 80 μm. Detectors were prepared from both substrate types by evaporation of Ni/Au Schottky contacts on the top and of Ti/Pt/Au quasi ohmic contact on the bottom of the substrate. The influence of the substrate quality on the electrical properties of produced detectors with two different sizes of 2 and 3 mm in diameter was evaluated. Capacitance measurements revealed that the required operating reverse bias for full detector volume depletion was 250 V in the case of #IT samples and over 400 V for the #USA samples. The current-voltage characteristics showed the best parameters for small (2 mm diameter) detector samples labelled #IT with the lowest reverse current of about 3.47 pA median value and breakdown voltage above 850 V, with best homogeneity of measured parameters over the sample group.