



Contribution ID: 6

Type: Poster

The radiation damage of PIN diode detectors irradiated with heavy ions studied with the positron annihilation spectroscopy

Monday, 25 October 2021 16:15 (2 hours)

The radiation damage of PIN diode detectors irradiated with heavy ions studied with the positron annihilation spectroscopy

K. Z. Krutul¹, P. J. Napiorkowski¹, P. Horodek², K. Hadyńska-Klęk¹, K. Wrzosek-Lipska¹, M. Komorowska¹, M. Paluch-Ferszt¹, Z. Szepliński¹, A. Olejniczak^{3,4}, K. Siemek^{2,4}, T. M. N. Le^{4,7}, V. A. Skuratov^{4,5,6}

¹Heavy Ion Laboratory, University of Warsaw, Poland

²Institute of Nuclear Physics, Polish Academy of Sciences, Kraków, Poland

³Nicolaus Copernicus University, Toruń, Poland

⁴Joint Institute for Nuclear Research, Dubna, Russia

⁵National Research Nuclear University MEPhI, Moscow, Russia

⁶Dubna State University, Dubna, Russia

⁷Institute of Physics, Vietnam Academy of Science and Technology, Hanoi, Vietnam

The damage of semiconductor detectors caused by the ionizing radiation is a widely known phenomenon. In particular, the radiation resistance of PIN diodes used in various measuring systems have been the subject of research in the past. The response of such detectors to the high flux of gamma quanta [1], neutrons [2], protons and electrons [3] was studied.

The deterioration of the quality of the energy spectrum of the registered particles determines the scope of the detector's applicability. This is especially important when designing detection systems that are to operate with large streams of charged particles.

In the HIL in Warsaw [4] and at the JINR in Dubna the attempt has been made to document the radiation damage process of the 300 μm PIN diode type detectors.

The spectroscopic properties of the irradiated PIN diode detector were monitored by measuring the spectrum collected off-beam with the ^{241}Am α source. Structural defects caused by the heavy ions in the irradiated PIN diodes were tested using the positron annihilation spectroscopy. This is a sensitive tool for the investigation of the open-volume defects as vacancies and their clusters [5,6,7].

The results of measurements will be presented.

[1] B. Abi, F. Rizatdinova, Proceedings of the Topical Workshop on Electronics for Particle Physics, 390-393 (2009).

[2] V Sopko et al. JINST, 8, C03014 (2013).

[3] A. H. Johnston, 4th International Workshop on Radiation Effects on Semiconductor Devices for Space Application, Tsukuba, Japan, October 11-13, 1-9 (2000).

[4] K. Krutul et al., Acta Physica Polonica B, Proc.Sup., 13(4), 861-867 (2020).

[5] F. Tuomisto, I. Makkonen, Rev. Mod. Phys., 85, 1583 (2013).

[6] R. Krause-Rehberg, S.H. Leipner, Springer, Berlin (1998).

[7] P. Horodek, Vacuum 164, 421 (2019).

Primary author: KRUTUL, Katarzyna (University of Warsaw, Heavy Ion Laboratory)

Co-authors: NAPIORKOWSKI, Paweł (University of Warsaw, Heavy Ion Laboratory); HORODEK, Paweł (Joint Institute for Nuclear Research); WRZOSEK-LIPSKA, Katarzyna (University of Warsaw, Heavy Ion Laboratory); HADYŃSKA-KŁĘK, Katarzyna (University of Warsaw, Heavy Ion Laboratory); KOMOROWSKA, Michalina (University of Warsaw, Heavy Ion Laboratory); PALUCH-FERSZT, Monika (University of Warsaw, Heavy Ion Laboratory); SZEFLIŃSKI, Zygmunt (University of Warsaw, Heavy Ion Laboratory); OLEJNICZAK, Andrzej (Joint Institute for Nuclear Research); SIEMEK, Krzysztof (Joint Institute for Nuclear Research,); LE, Tran Minh Nhat (Joint Institute for Nuclear Research); SKURATOV, Vladimir (FLNR, JINR)

Presenter: KRUTUL, Katarzyna (University of Warsaw, Heavy Ion Laboratory)

Session Classification: Poster session