This research was partially supported by KAKENHI (19760050).

R12-29: Understanding of Si Microstrip Detectors

M. R. Patil
DHEP department, Tata Institute Of Fundamental I Research, Mumbai, Maharashtra, India
On behalf of the EHEP group TIFR, Mumbai India.

Microstrip Si detectors are highly used in High Energy Physics experiments forming a crucial component of a tracker sub-detector in a collider detector. Two dimensional simulations of the electrical properties of Si microstrip detectors of various width/pitch configurations have been systematically performed using a process and device simulation tool ...Silvaco based TCAD Atlas/Athena, Taurus Medici (Medici and Supreme). Transient simulation of the strip detector is also done using a radioactive source.

Polysilicon biased Si microstrip detectors are fabricated at BEL in Bangalore as prototypes for R&D phase with end use in High Energy experiments. This has thus proved the feasibility of the technology on 4inch Si wafer. The actual quality control tests of these microstrip detectors have been done at our EHEP laboratory in TIFR, Mumbai and the results understood giving a insight into the various aspects of the strip detector. The different measured parameters include the bulk I-V characteristics, C-V characteristics giving the breakdown voltage and the depletion voltage of the strip detector and also the total capacitance of individual strips, strip leakage current, pin-hole test, polysilicon bias resistance measurement, all reflecting the quality of the implanted p+ strips on n substrate. The transient study of the detector using a semi-conductor laser is planned to be done and the tests analysed for the signal/noise and hence the figure of merit of the strip detector.

I acknowledge the fruitful discussions and guidance of Prof Tariq Aziz, Kameshwar Rao, Sanjay Chendvankar and all my colleagues form EHEP group, TIFR Mumbai.

R12-30: Spectroscopic Response of CZT Detectors Obtained by the Boron Encapsulated Vertical Bridgman Method

N. Auricchio1, E. Caroli2, A. Donati2, L. Marchini3, M. Zanichelli1, A. Zappettini1, M. Quadrini5
1Dept. of Physics, University of Ferrara, Ferrara, Italy
2IASF-Bo, INAF, Bologna, Italy
3IMEM, CNR, Parma, Italy
4Dept. of Physics, University of Parma, Parma, Italy
5IASF-Milano, INAF, Milano, Italy

A great effort is being presently devoted in growing and studying CdTe and CdZnTe detectors which can be used in a large variety of applications, such as the basic, medical, industrial, and space research. The purpose of this paper is to present the spectral response at different energies of some CZT crystals grown with the boron oxide encapsulated vertical Bridgman method by IMEM-CNR. The most important feature of the technique is that the crystal, during the growth, is fully encapsulated by a thin layer of liquid boron oxide, so that the crystal-crucible contact is prevented. Using this material, several detectors were realized of about 4x4x1 mm³ in size and with electrical gold contacts on both the surfaces obtained by two different techniques: vacuum vaporization deposition and electroless. The behavior of these detectors was studied as a function of the bias voltage, shaping time and energy of the interacting photons. The charge transport properties (μτ products) were measured with radioactive sources. We present the results of the spectroscopic characterization of some samples.

R12-31: Characterization of AlSb Room Temperature Semiconductor Detectors Grown Using the Czochralski Growth Technique

B. W. Sturm, R. Nikolic, A. W. Coombs, K. J. J. Wu
Lawrence Livermore National Laboratory, Livermore, California, USA

AlSb is a promising type III-V compound semiconductor being studied as a new radiation detection material. The high Z of 51 and indirect band gap of 1.6 eV are properties very suitable for room temperature gamma-ray spectroscopy. In this study, AlSb crystals are being grown at our laboratory and characterized through different techniques. Hall measurements were conducted to provide material electrical properties such as carrier concentration, mobility and resistivity, helping us to understand how such properties are affected by growth conditions. Radiation detection measurements have also been carried out in a temperature controllable vacuum-sealed cryostat using alpha-rays and gamma-rays. Alpha-ray data taken indicates only partial depletion of the device. However, good alpha-ray spectroscopy behavior in a number of samples at room temperature indicates the potential for this material in radiation detection applications. Alpha-ray and gamma-ray measurements both at room temperature and reduced temperature environments will be reported.