Development of Process Technology for Photon Radiation Measurement Applications

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ABSTRACT

This thesis presents work related to new types of photo detectors and their applications. The focus has been on the development of process technology and methods by means of experimentation and measurements. The overall aim has been to develop and improve photon radiation measurement applications which are possible to manufacture using standard Si processing technology.

A new type of position sensitive detector that has switching possibilities based on the MOS principle has been fabricated and characterized. The influence of mechanical stress on the linearity of position sensitive detectors has been investigated. The results show that mechanical stress arising, for example, by the mounting of detectors in capsules can have an impact on device performance. Under normal circumstances these effects are rather small, but are considered to be worthwhile taking into account.

Electroless deposition of Nickel including various dopants in porous silicon was performed to manufacture electrical contacts for this interesting material. After heat treatment it was confirmed by X-ray diffraction that Nickel silicide had been formed and I-V measurements show that different contacts exhibit Ohmic and rectifying behaviour.

Spectrometers are used extensively in the process and food industry to measure both the chemical content and the amount of substances used during manufacturing. These instruments are often rather bulky and costly, though the trend is towards smaller and more portable equipment. A spectrometer based on an array of Fabry-Perot interferometers mounted close to an array detector is shown to be a viable option for the manufacture of a very compact device. Such a device has minimal intermediate optics and it may be possible, in the future, for it to be developed and completely integrated with a detector array into a single unit.