

SiC-based pin-type photodiode with shallow emitter for radiation measurements below 200nm - Device structure, characterization and applications

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State of the art SiC UV Schottky photodiodes are already capable of detecting VUV light [1, 2]. Up to now, however, no VUV sensitive 4H-SiC pin-type photodiode has been reported. Here, a higher sensitivity can be expected for pin-photodiodes, since the usage of a front metal is avoided, which otherwise strongly absorbs UV light particularly at short wavelengths [3].

To achieve sensitivities below wavelengths of 200 nm, a shallow p-emitter is needed, since shorter wavelengths are strongly absorbed in 4H-SiC [4]. Furthermore, a low excess carrier lifetime in the p-emitter necessitates a short distance of the generated electron hole pairs towards the space charge region. Consequently, a shallow p-emitter is required to shift the space charge region close to the surface. To achieve a shallow p-emitter aluminum ion-implantation was used in this work.

This contribution discusses the newly developed device structure, as well as the electrical and optical parameters of the photodiodes. The so-called VUV SiC photodiode provides a reasonable sensitivity down to 145 nm as measured at the PTB metrological light source (MLS) as depicted in figure 1, while maintaining a low dark current and serial resistance.

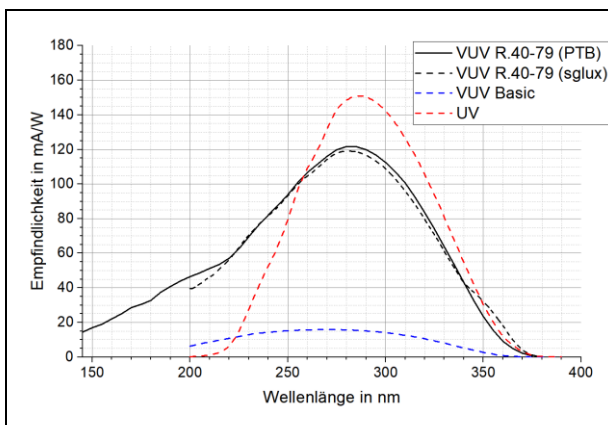


Figure 1: spectral response (SR) measurement of VUV and UV photodiodes. The straight black line is measured at the MLS by the PTB. The dotted lines are measured using a double monochromator and a Xenon light source by sglux. The dotted red line shows the typical SR of a sglux UV photodiode. The dotted blue line has no special contact grid.

References

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