The blue light defects activation in a-Si:H pin photodiode as a biosensor

Prof. dr. sc. Vera Gradišnik

The microfluidic Lab-On-Chip (LOC) systems, based on the CMOS technology, today grow rapidly based on requirement of the Point-of-care-testing (POCT). It is a need for a high sensitive biotransducers, as a part of biosensors to be integrated on LOC system. To detect low-level of light emitted by an analyte, promising material and devices are a p-i-n a-Si:H photodiodes. The observed absorbance of blue light in human cells HeLa (cervical carcinoma) induct H2O2 in same cells and consequently, chemical reaction with NO, detected as chemiluminescence signal by the photodiode, as well as formation of cytotoxic singlet oxygen. On the other side a-Si:H p-i-n photodiode has a high sensitivity on blue light at low-light intensity, good spectral responsivity and small reflectance for blue light, low dark current, low-noise in the range of low reverse bias voltages. The photoconductivity of a-Si:H p-i-n photodiode is influenced by the native and light induced localized state density and their energy distribution in the energy gap of intrinsic a-Si:H. It is observed that the defect states of i-layer at various bias voltages contribute to the detection of HeLa cells chemiluminescence. The optical bias dependence of modulated photocurrent method (OBMPC) using the blue LED light is applied to clarify the energy gap density of state nature and energy distribution, respectively in a-Si:H p-i-n photodiode i-layer