

## Chemiresistive VOC sensor materials based on silicone rubber composites

Sandra Guzlēna<sup>1</sup>, Gita Šakale<sup>1</sup>, Valdis Teteris<sup>2</sup>, Jānis Barloti<sup>2</sup>, Velta Tupureina<sup>3</sup>, Māris Knite<sup>1</sup>

<sup>1</sup>Institute of Technical Physics, Riga Technical University, Latvia

<sup>2</sup> Institute of Radio-electronic, Riga Technical University, Latvia

<sup>3</sup>Institute of Polymer materials, Riga Technical University, Latvia

e-mail: Sandra.Guzlena@gmail.com

There is a need for simple, sensitive and stable electronic sensors suited for Volatile organic compound (VOC) detection in a wide spectrum of applications ranging from lab-on-a-chip to environmental monitoring, as opposed to the often employed expensive, bulky and complicated instrumental methods. The need for inexpensive, low-power, fast recovery and repeatable use sensors is fuelling the large increase of research in this area. Silicone rubber has better heat resistance, electric conductivity and chemical stability comparing to ordinary organic rubbers. These are properties why silicon rubber is promising matrix material for VOC sensors.

Highly structured nanocarbon black has been used as nanofiller material. Homogenous composite mixture of nanofiller and silicone rubber was coated on crystalline glass-ceramic with aluminum electrodes by dip coating method. Composites were cross-linked in different condition by, changing pressure, temperature and atmosphere. Crosslinking time was maintained constant. During crosslinking the composite electrical resistance was measured as indicator of composite system electric network formation. After curing the Fourier transform infrared spectroscopy (FTIR) was used to evaluate chemical bond changes, which could approve that crosslinking reactions are completed. Relative electrical resistance change of silicon rubber composites was measured, when the composite samples were exposed to different concentrations of non-polar toluene vapours. Fast recovery of the composite electrical resistance has been noticed, when the composite is removed from exposure source.

### References

1. S. C. Shit, P. Shah, Natl. Acad. Sci. Lett. **36**, 355 (2013)