Final Report

Project acronym: *VOC-DETECT*

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Publishable project summary

Volatile Organic Compounds (VOC) have a large presence in most indoor areas (both households and working environments). According to a European Union study, they are one of the chemicals that cause the most concern related to the public health. Numerous studies revealed the toxic effect of these VOCs and most of them were able to connect the human diseases to the presence of VOC in indoor air. For example, some studies have suggested an influence of VOC exposure on the immune status of the new-born child after maternal exposure, such as the enhancement of sensitization and the risk of asthma or respiratory symptoms. Other studies referred to the carcinogenic effect of some VOCs (e.g.formaldehyde). Despite years of research, the tools for the detection of VOCs are still not very precise and are too expensive. For these reasons the project proposed to develop new sensors based on nano MOX (Metal Oxide) and CNT (Carbon Nanotubes) materials for VOC detection, integrated into a smart portable system providing quantitative information about the concentration of Formaldehyde and Benzene as VOCs in indoor air. The focus of the project was on the development of new sensors, highly sensitive, and selective, for detection of the most dangerous VOCs affecting the human health at low concentration exposure and with a high probability to be found in houses and working environments: Formaldehyde and Benzene. Sensitive materials (CuO and CoO films) with detection properties of volatile organic compounds (formaldehyde and benzene) were tested by depositing them on alumina transducers with different thicknesses. The target gas concentrations were established in the range of 0.5-4.0 ppm. The selectivity of the sensors for the two VOC gases was measured. It can be concluded that the sensors with sensitive film of CuO are partially selective for formaldehyde and have a lower working temperature by 80^0C than the sensors with sensitive film of CoO, which are also partially selective to formaldehyde, but at higher working temperatures. From the experimental point of view, the sensors have a good response (110-230 seconds), reproducible, and a complete recovery for the tested VOC gases. At the end, a Smart portable system to be used in houses or working environment was provided (see figure 2.1). The measurement data can be received and read with the help of an application developed on the phone through a bluetooth connection.