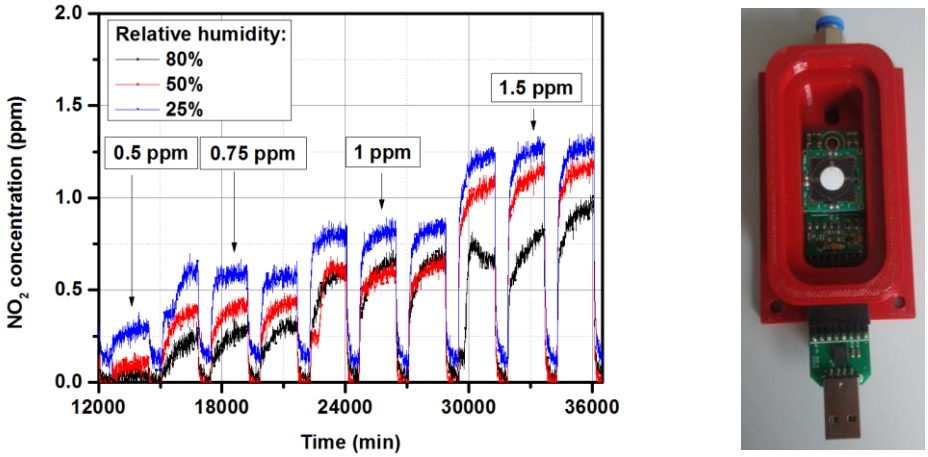
THE IMPACT OF RELATIVE HUMIDITY FOR NITROGEN DIOXIDE MEASUREMENTS IN AUTOMOTIVE APPLICATION

Dominik Grochala

AGH University of Science and Technology, Institute of Electronics, Al. Mickiewicza 30, 30-059 Kraków, Poland
e-mail: grochala@agh.edu.pl (e-mail address of the corresponding author)

Nitrogen dioxide (NO_2) is a well-known pollutant gas that has a negative impact on the environment and human health. Therefore, the World Health Organization (WHO), as well as, many other national and international agencies have released the guidelines where the toxic effect of NO_2 are in detail presented [1-3]. Since one of the main sources of nitrogen dioxide is cars, in general, automotive industry, more and more accurate gas sensors are required to control exhaust emission in cities and in outside, with special emphasis on agriculture areas.

Many types of gas sensors are used to detect the presence of nitrogen dioxide in the samples and ambient air, including electrochemical sensors, catalytic sensors, optical sensors, and recently developed metal oxide (MOX) based gas sensors [4-5]. However, the main limitation for all the above-mentioned types of sensors is interferences compounds that could be found in the sample under test, for example, high relative humidity (RH) concentration. Since RH cannot be always removed without reducing the target gas concentrations a novel techniques are needed to include the relative humidity effect on the gas sensors response.



(a) (b)

Fig. 1. (a) the gas-sensing characteristics obtained under exposure to various concentrations of relative humidity (25%, 50%, 80%) and nitrogen dioxide (0.5, 0.75, 1.0, 1.5 ppm) at room temperature; (b) the photo of the measurement chamber with gas sensor

In this paper, I have proposed a novel algorithm to reduce the impact of relative humidity for gas-sensing measurement. The research was conducted with the utilization of the commercially available gas sensor to increase repeatability. Thanks to the developed solution, the obtained results are less sensitive to relative humidity changes in the outdoor environment and enable the measurements in the wide range of RH.

[1] WHO. Formaldehyde. In Selected Pollutants. WHO Guidelines for Indoor Air Quality; WHO, Regional Office for Europe: Copenhagen, Denmark, 2010; pp. 103–156. ISBN 978-92-890-02134
[2] EUR-Lex—L:2008:152:TOC—EN—EUR-Lex.
[3] Immediately Dangerous to Life or Health Concentrations: NO_2 NIOSH Publications and Products
[4] P. Nowak, W. Maziarz, A. Rydosz, K. Kowalski, M. Ziabka, K. Zakrzewska, Sensors 2020, 20(23), 6830
[5] W. Maziarz, Applied Surface Science 2019 (480) 361-370

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