

SEMICONDUCTING METAL OXIDES IN BIOMARKER DETECTION FOR MEDICAL APPLICATIONS

Mihai Brînză

Technical University of Moldova, Center of Nanotechnologies and Nanosensors,
Studentilor str., 9/7, Chisinau, Moldova

Healthcare sector is gradually developing and in a constant need of new technologies appealing to daily needs and evolution of different diseases. A big potential, as well as a big challenge for the entirety of research community is to make novel methods that will help medical field experts in diagnosing through non-invasive methods different diseases.

Human breath presents a bigger potential in diagnosis as it has a lot of biomarkers in it, therefore their detection could present a big opportunity to detect and determine physiological state, to diagnose diseases or even assess environmental exposure [1]. Different gases of different concentrations offer information to different diseases. For instance, in a recent study on volatile organic compounds in exhaled breath for lung cancer discrimination [2], it was determined that specific doses of 2-propanol have been found in patients of with lung cancer. Thus, another study could take place [3], therefore a MOX based sensor from TiO₂ and coated with PTFE was made with the reason to detect different gases, 2-propanol being targeted as well. In the same way, another step of progress has been made in another study [4] where a TiO₂ thin film nanostructure has been made and coated with PV4D4 to detect both NH₃ which usually is associated with kidney failure and H₂ which is associated not only with gastric and lower bowel diseases, but also in food industry with some defect canned products.

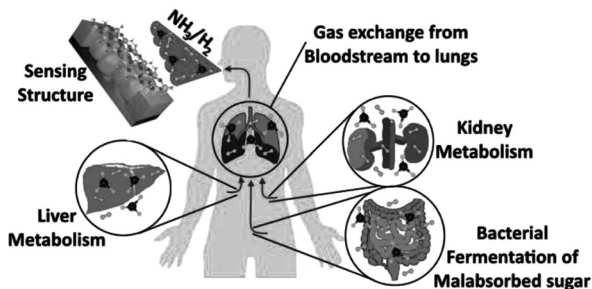


Figure 1. Abstract concept on Human Breath's biomarkers detectors and applied field [4]

Thus the awareness of this potential technologies, progressing diseases and new methods to detect them beforehand remains to be researched further. Succeeding in this direction will benefit both researchers and medical experts as it will offer the possibility to improve further breath biomarker detectors and new data on human body.

The study was partially supported by the by State Program LIFETECH « Innovations in Biomedical Engineering: Advanced Technologies and Applications for Data Acquisition, Processing and Analysis » No. 020404 at Technical University of Moldova.

References

- [1] O. Lupan et al., “Single CuO/Cu₂O/Cu Microwire Covered by a Nanowire Network as a Gas Sensor for the Detection of Battery Hazards,” *ACS Appl Mater Interfaces*, vol. 12, no. 37, pp. 42248–42263, Sep. 2020, DOI: 10.1021/acsami.0c09879.
- [2] L. and N. Ü. Kännaste Astrid and Copolovici, “Gas Chromatography–Mass Spectrometry Method for Determination of Biogenic Volatile Organic Compounds Emitted by Plants,” in *Plant Isoprenoids: Methods and Protocols*, M. Rodríguez-Concepción, Ed., New York, NY: Springer New York, 2014, pp. 161–169. DOI: 10.1007/978-1-4939-0606-2_11.
- [3] A. J. Mouton et al., “Alcohol Vapor Inhalation as a Model of Alcohol-Induced Organ Disease,” *Alcohol Clin Exp Res*, vol. 40, no. 8, pp. 1671–1678, 2016, DOI: <https://doi.org/10.1111/acer.13133>.
- [4] A. Smędra, M. Trzmielak, K. Góralaska, M. Dzikowiec, E. Brzezińska-Lasota, and J. Berent, “Oral form of auto-brewery syndrome,” *J Forensic Leg Med*, vol. 87, p. 102333, 2022, DOI: <https://doi.org/10.1016/j.jflm.2022.102333>.

Corresponding author:

Mihai Brinza

UTM, FCIM, DMIB, CNN

Studentilor str., 9/7, Chisinau MD2045 Moldova

e-mail: mihai.brinza@mib.utm.md

Tel: 069215548

ORCID: 0000-0001-8438-3800