COMMERCIAL METAL OXIDE SENSOR SENSITIVE TO HIGHER ALKANE

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Sensing of Atmospheres and Monitoring

OBJECTIVES

- Breath analysis by electronic noses for cancer screening requires the selection of sensors that detect cancer biomarkers
- A large amount of studies on cancer biomarkers have found that higher alkanes are likely biomarkers[1-2]. Higher alkanes are usually not well detected by commercial metal oxide sensors[3]. A group of sensors is being tested to evaluate their reaction to decane vapour, a probable lung cancer biomarker.

METHODS

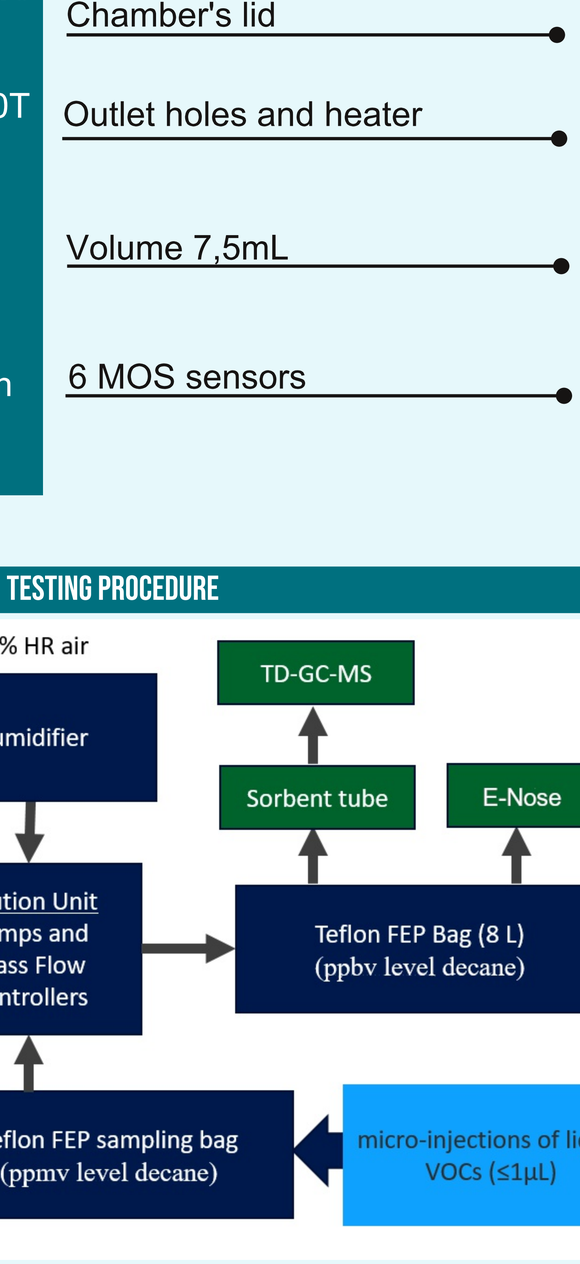
The electronic nose : SAMBre

Sensors

- T2603 (Figaro®)
- 3530T, 1430T, 2530T, 8530T (Umwelt Sensor Technik®)
- MP901 (Winsen®)
- BME680 (Bosh®)

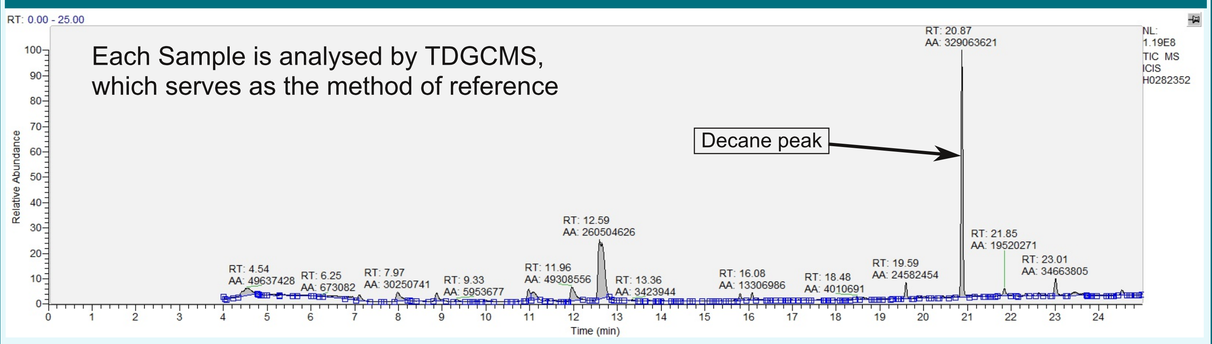
Specifications

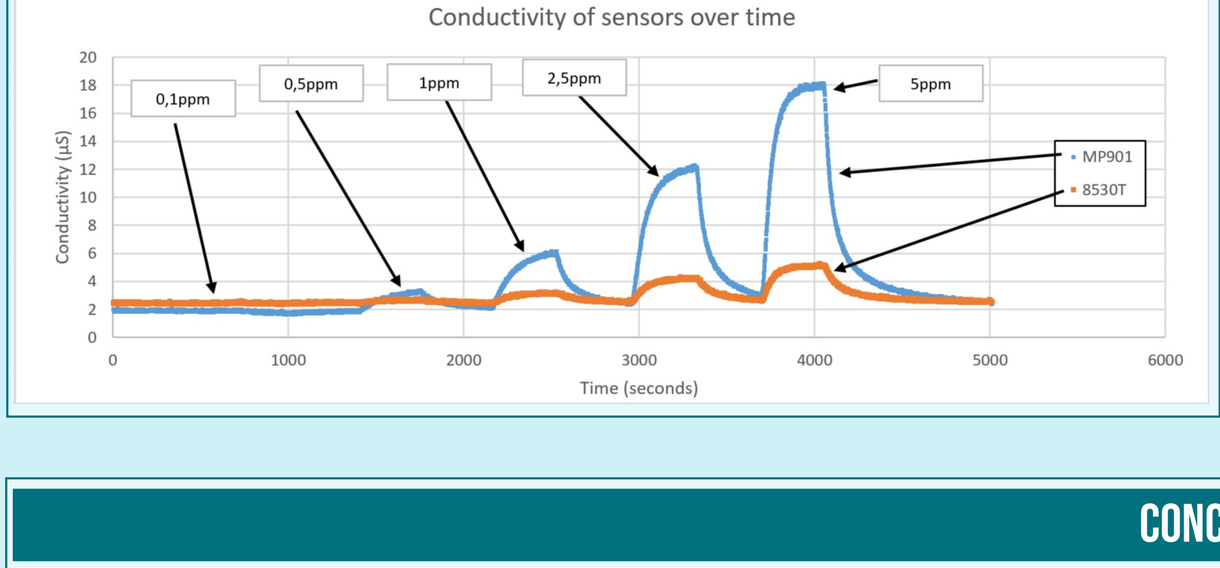
- Temperature maintained at 45°C within chamber
- Flow constant at 200mL/min
- Moisture and temperature monitored



TESTING PROCEDURE

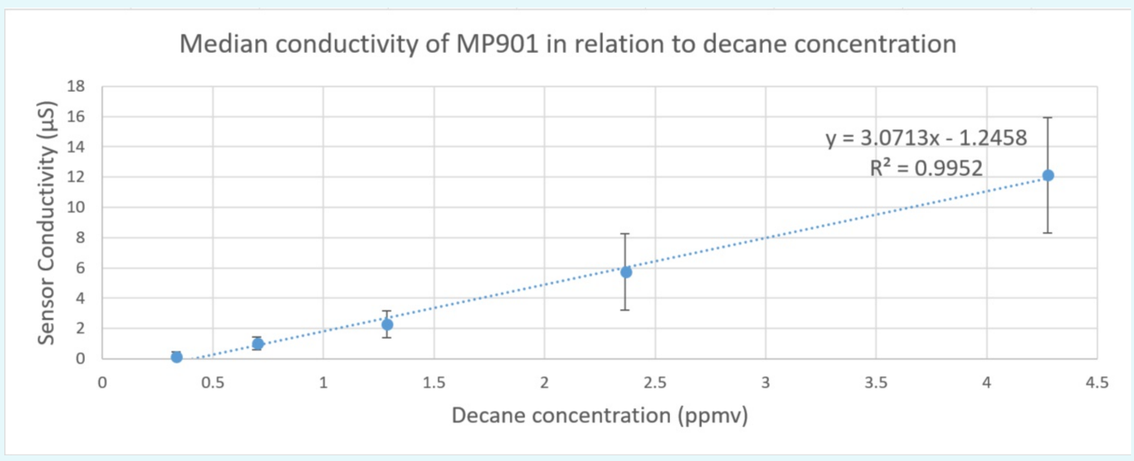
SAMPLE ANALYSIS

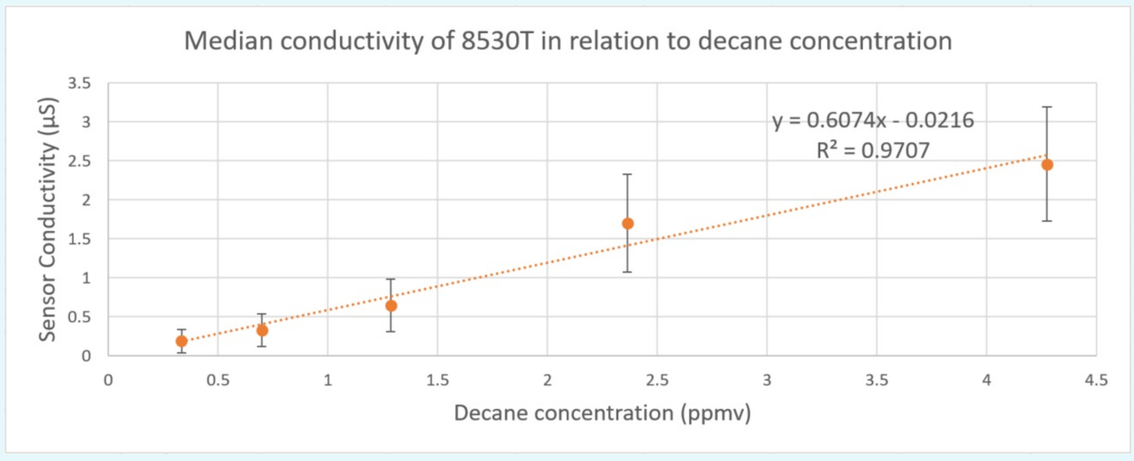




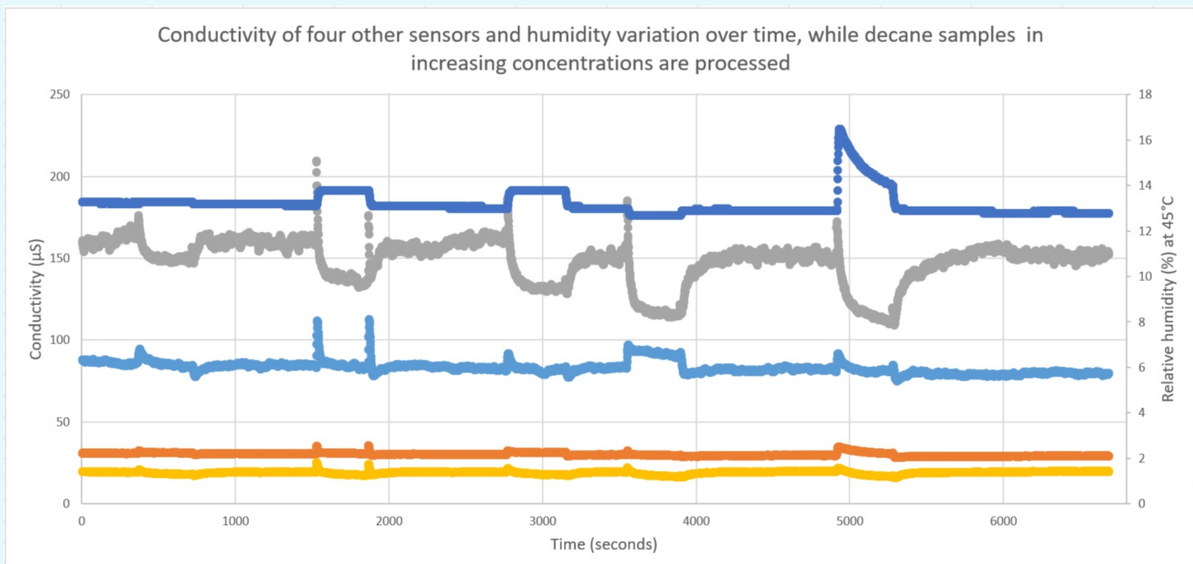
RESULTS

- The two sensitive sensors show a response proportional to the amount of Decane in the sample. Their sensitivity is higher than other sensors previously reported in literature.





- The other sensors show no response, or a response linked to varying amount of moisture in the sample



- 3530T is sold as an hydrocarbon-sensitive sensor, but doesn't react to decane. 8530T is sold as an ethanol sensor, but does react. Both are from the same manufacturer. This underlines the need to expose commercial sensors to various compounds to create a database of sensitivities, which would help in first approach sensor selection.

CONCLUSIONS

- The response of the MP901 and 8530T is directly correlated to the sample concentration in n-decane, which is not the case for the other sensors.
- Replacing sensors by new sensors of the same model shows similar behaviour, with varying sensitivity.
- This is valuable for biomarker detection and calls for more testing using other alkanes and usually undetected biomarkers.

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[1] G. Peng et al., 'Diagnosing lung cancer in exhaled breath using gold nanoparticles', Nature Nanotechnology, vol. 4, no. 10, pp. 669–673, Oct. 2009, doi: 10.1038/nnano.2009.235.
[2] A. Bajtarevic et al., 'Noninvasive detection of lung cancer by analysis of exhaled breath', BMC Cancer, vol. 9, no. 1, p. 348, Dec. 2009, doi: 10.1186/1471-2407-9-348.
[3] D. Kohl, L. Heinert, J. Bock, Th. Hofmann, and P. Schieberle, 'Systematic studies on responses of metal-oxide sensor surfaces to straight chain alkanes, alcohols, aldehydes, ketones, acids and esters using the SOMMSA approach', Sensors and Actuators B: Chemical, vol. 70, no. 1, pp. 43–50, Nov. 2000, doi: 10.1016/S0925-4005(00)00552-9.

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