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Symposium NM03: Progress in Developing and Applications of Functional One-Dimensional Nanostructures

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4:15 PM - NM03.08.03
Site-Specific Growth and *In Situ* Integration of Nanowire Networks for Sensing Applications

Lukas Hrachowina¹, Guillem Domènech-Gil², Michael Seifner¹, Jordi Sama², Isabel Gracia³, Carles Cane³, Albert Romano-Rodriguez², [Sven Barth](#)¹

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Nanostructured, porous oxides are prominent sensing materials due to the reversible change in resistivity upon changes in the surrounding atmosphere. Nanowires have gained considerable attention in gas sensing devices due to their high surface to volume ratio and high crystallinity. However, the cost effective integration of nanowires in functional devices is usually challenging and costly. We present a cost effective and simple growth strategy using CMOS-compatible micromembranes containing a buried heating element, which is used for thermally induced chemical vapour growth of SnO₂, WO₃ and Ge. In addition, the buried heater can be used as the heating source for the effective operation as sensor. The small membrane volume and area requires low power (few mW) for both the growth and the operation of the resulting devices. The actual devices contain a porous network of nanowires bridging interdigitated electrodes on top of the membrane for the electrical readout. Secondary deposition products are negligible, which can be demonstrated by cross-sectioning of the active part of the device. The devices have been successfully used in monitoring changes in CO [1], ammonia [2] and humidity [3] concentrations and show long-term stability. This contribution will address growth strategies and specific considerations for three different materials in regards to their applicability for sensor applications and the simple fabrication of an electronic nose configuration.[4]

References
[1] S. Barth, R. Jimenez-Diaz, J. Sama, J. D. Prades, I. Gracia, J. Santander, C. Cane, A. Romano-Rodriguez. *Chem. Commun.* **2012**, 48, 4734.
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[3] J. Sama, G. Domenech-Gil, M. Seifner, J. Santander, C. Calaza, I. Gracia, S. Barth, A. Romano-Rodriguez, *Sens. Actuators B*, **2017**, 243, 669.
[4] L. Hrachowina, G. Domenech-Gil, M. Seifner, I. Gracia, C. Cane, A. Romano-Rodriguez, S. Barth, *manuscript submitted*.