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Program

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Site-specific growth and in situ integration of nanowires for sensing applications: a methodology towards an electronic nose

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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.

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 tin oxide, tungsten oxide and germanium nanowires as well 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 device contains a porous network of nanowires bridging interdigitated electrodes on top of the membrane for the electrical readout. Secondary deposition products should be 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 humidity [2], CO and ammonia [3] concentrations and show long-term stability. Finally, the first device containing different materials grown in situ on one chip are presented, which paves the way to in situ preparation of electronic noses based on nanowires [4].

[1] S. Barth, R. Jimenez-Diaz, J. Sama, *et al. Chem. Commun*. 2012, 48, 4734.

[2] J. Sama, S. Barth, G. Domenech-Gil, *et al*. Sens. Actuators B 2017, 243, 669-677.

[3] J. Sama, S. Barth, G. Domenech-Gil, *et al*. Sens. Actuators B 2016, 232, 402-409.

[4] L. Hrachowina, G. Domenech-Gil, M. S. Seifner, *et al. submitted.*