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Abstract

Heterogeneous Integration of Metal Oxides—Towards a CMOS Based Multi Gas Sensor Device †

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A worldwide unique CMOS based chemical sensor device comprising an array of 8 microhotplates (μhps) for a total of 16 chemical sensors has been fabricated (Figure 1). Ultrathin (50 nm) SnO_2 films have been heterogeneously integrated on the device by spray pyrolysis technology, photolithography and etching. Subsequently the SnO_2 films are functionalized with metallic nanoparticles (NPs) such as Au, Pt, AuPd, or NiPt in order to improve sensitivity and selectivity. Figure 2 shows the strongly improved response of a NiPt-functionalized SnO_2 sensor towards carbon monoxide (10–200 ppm, 25–75% rh): at an operation temperature of only 150 °C the sensor exhibits a response of more than 90%. Presently different metal oxide films (SnO_2, ZnO, CuO) additionally functionalized with NPs are processed on the μhp-array chip. This is the approach of choice for realization of a fully CMOS integrated multi-gas sensor device.

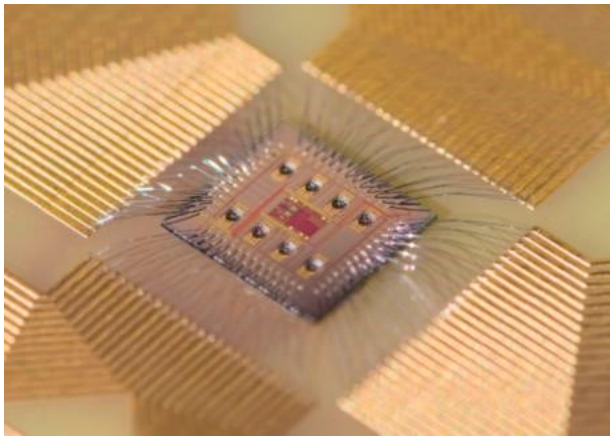

Figure 1. Chemical sensor device comprising an array of 8 μhps for a total of 16 sensors.

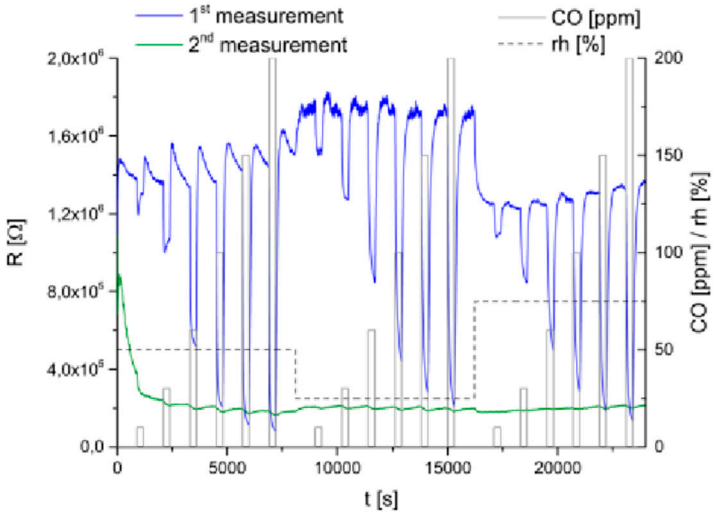

Figure 2. Response of SnO_2 thin film sensor, functionalized with NiPt-NPs towards CO.

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