

593b Direct Formation of Highly Porous Gas-Sensing Films by in-Situ Thermophoretic Deposition of Flame-Made Pt/SnO₂ Nanoparticles

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Flame spray pyrolysis (FSP) was used to make pure and Pt-doped tin dioxide nanoparticles in one-step. The aerosol generated by the dry FSP method was directly, in-situ thermophoretically deposited onto interdigitated Pt-electrodes to form a porous, thick film of controlled thickness within the active sensor area. Tin oxide grain size (10 nm) and a high film porosity (98 %) were preserved for all film thicknesses from 9 to 40 micro meter using different deposition times. The dependence of the film thickness on deposition time was theoretically estimated to enable precise control of the deposition process. Platinum doping did not affect the SnO₂ grain size, crystallinity, or the porous film structure. These sensors exhibited high carbon monoxide (CO) sensor signals (8 for 50 ppm CO in dry air at 350°C), good reproducibility, high analytical sensitivity and a remarkably low detection limit (1 ppm CO in dry air at 350°C). The in-situ platinum doping enhanced the overall sensor performance. Increasing the film thickness increased the sensor resistance and can be used to tune sensor performance.