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Design and Trial Production of Microstructured ZnO Gas Sensor

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A microstructured gas sensor designed with a test electrode array is fabricated, which increases the amount of data collected by taking five groups of signals to avoid instability. By introducing a new ring heating structure, the designed sensor can effectively decrease power consumption. The relationships of surface morphology, preferred orientation and electrical properties of ZnO thin films prepared by RF magnetron sputtering with substrate temperature and annealing treatment are discussed. The results show that the resistivity of ZnO films can be as low as 6.46×10^{-3} Ω·cm under the preeminent preparation conditions of 200 °C, $\psi(Ar:O_2) = 24:3$ and working power of 180 W. By annealing for 30 min at 600 °C, the film quality improves considerably and the resistivity increases by at least three orders of magnitude. The sensor operating at 225 °C exhibits good sensitivity, and the response and recovery times for 1.0% methane and ethanol are 28 and 57 s, and 8 and 251 s, respectively. The sensor is extremely stable in 1% methane and ethanol.

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