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B — 5 — 8 Operation and Stability of SnO_2 Gas Sensors

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Wide-gap oxide-semiconductors (e.g. ZnO, SnO_2, WO_3) are suitable materials for solid-state components detecting various gases. Reproducibility and a short regeneration time of the sensing element usually require working temperatures much higher than room temperature. On the other hand a high working temperature will shorten the life time of the sensor element.

With SnO_2- thin film sensors high sensitivity and rise times of the order 0.1 sec are realized at a working temperature of 400°C. From measurements of the rise times at different oxygen pressures it is concluded that the change in conductivity in presence of an oxidizable gas is due to the change of the concentration of the chemisorbed oxygen at the surface and not to the chemisorption of the gas itself. The regeneration of the sensor is effected by the increase of the concentration of the adsorbed oxygen.

Some of the sensors show a degradation in sensitivity when working for a long time at elevated temperatures. By annealing sensors at different temperatures it is shown that the concentration of the most active defects at the surface which contribute the main part to the conductivity in a sensitive sensor is decreased. As a consequence not only the conductivity is decreased but also the oxidation reaction with the gas which leads to the lower sensitivity of the sensors.