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Sensitivity of SnO_2-Based Thick-Film Devices to CH_3CN

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The effects of Pd doping of SnO_2 on gas sensitivity to CH_3CN (acetonitrile) and the gas sensing mechanism of SnO_2-based sensors have been studied. The sensing mechanism of SnO_2-based sensors for CH_3CN was investigated by FTIR analyses using a gas IR cell. In the ambient of 170 ppm CH_3CN, the sensitivity and optimum operating temperature were about 93% and 300°C, respectively. The time response of Pd-doped SnO_2 sensors to CH_3CN at 300°C was about three seconds.

1. Introduction

In recent years, there has been increasing demand for sensing devices which monitor inflammable or toxic gases of low concentration (ppm level). Many studies have been carried out for the development of highly sensitive and selective semiconductor gas sensors.[1-3] The electrical conductivity of metal oxide semiconductors is known to depend upon the concentration of oxygen vacancies in the lattice and that of gases adsorbed onto the surface. The n-type metal oxides such as SnO_2 or ZnO are normally oxygen-deficient, and the resulting interstitial cations or oxygen vacancies act as donors which increase the surface conductivity, whereas the adsorbed oxygen ions act as surface acceptors which decrease the surface conductivity.[3,4] SnO_2 has been studied most extensively as an important base material of gas-sensing devices. Addition of Pd or Pt to SnO_2 is known to provide enhanced sensitivity and