

Thin-Film Micro-Gas Sensor for Detecting CH₃SH

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A highly sensitive and selective SnO₂-based micro-gas sensor for detecting CH₃SH has been fabricated using thin-film deposition and micromachining techniques. The entire chip size is 3 × 4 mm² and the power consumption at the operating temperature of 250°C is about 55 mW. Excellent thermal insulation of the membrane is achieved by the use of a double-layer structure of 0.2-μm-thick Si₃N₄ and 1.4-μm-thick phosphosilicate glass (PSG) prepared by low-pressure chemical vapor deposition (LPCVD) and atmospheric-pressure chemical vapor deposition (APCVD), respectively. Durability testing of the membrane is performed with the temperature cycle between room temperature and 350°C, and the membrane shows excellent mechanical stability. The present work clearly shows that a Pd-doped SnO₂ thin-film micro-gas sensor operating at 250°C can detect CH₃SH sensitively and selectively.

1. Introduction

The main requirements for gas sensors are high sensitivity and selectivity, short response time, long-term stability of their characteristics under severe operating conditions and low power consumption.

There has been considerable interest in the silicon-based micro-gas sensor made using microfabrication and micromachining techniques⁽¹⁻⁵⁾ because it meets the above-mentioned requirements and has the advantages of accurate temperature control, small size, low cost due to automatic and batch production, easy realization of array sensors and possibility of integration with electronics.

A number of different device structures and sensing materials have been proposed to