Fabrication of Micro Formaldehyde Gas Sensor

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ABSTRACT

ABSTRACT A novel micro formaldehyde gas sensor with a sputtered NiO thin film integrated with a micro hotplate was fabricated. A microfabricated formaldehyde gas sensor is developed which uses a silica substrate with Pt micro heaters as the micro hotplate and a thin-film NiO layer as a conductivity-sensitive material. The substrate is deposited with NiO thin film as sensing elements, Pt resistors as heaters, and as interdigitated electrodes for resistance measurement. As voltages were applied to Pt heaters, temperature of micro hotplates increased. Thus, at 300oC, when formaldehyde was present in the atmosphere, it was adsorbed and as a result the electrical conductivity of NiO films was increased. The measured resistance between the interdigitated electrodes was changed. The formaldehyde gas sensor was integrated with a Pt resistor as a micro heater for the enhancement of sensitivity. A high selectivity to acetone, methanol and ethanol was alson shown in the study.

Keywords : formaldehyde ; MEMS ; micro heater ; NiO thin film

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REFERENCES

參考文獻 [1] Kap-Duk Song , Byung-Su Joo , Nak-Jin Choi, Yun-Su Lee , Jeung-Soo Hub , Byung-Ki Sohn and Duk-Dong Lee, The Fabrication Of Novel Micro Hot-Wire Sensor, The 12th International Conference on Solid State Sensors , Actuators and Microsystems.Boston .June 8-12, 2003.

[2] J.Hubalek, K.Malysz, J.Prasek, X.Vilanova, P.Ivanov, E.Llobet, J.Brezmes,X. Correig,Z. Sverak, Pt-load Al2O3 catalytic filters for screen-printed WO3 sensors highly selective to benzene, Sensor and Actuators B101, pp.277-283, 2004.

[3] I.Gracia,J.Santander, C.Cane, M.C.Horrillo, I.Sayago, J.Gutierrez , Results on the reliability of silicon micromachined structures for semiconductor gas sensors, Sensor and Actuators B77, pp.409-415, 2001.

[4] 林宗榮,周澤川,蔡志明,觸媒物質在化學感測器上的應用,化工技術叢書,2004年7月出版.

[5] James A. Dirksen , Kristin Duval , Terry A.Ring, NiO thin-film formaldehyde gas sensor, Sensors and Actuators B80, pp.106-115, 2001.

[6] Duk-Dong Lee , Wan-Young , Tae-Hoon Kim and Jong-Mu Baek, Low Power Micro Gas Sensor The 8th International Conference on Solid-State Sensor and Actuators, and Eurosensors IX, Stockholm, Sweden, June 25-29, 1995.

[7] Tobias Rosqvist, Stefan Johansson, Soft micromoding and lamination of piezoceramic thick films, Sensor and Actuator A 97-98, pp.512-519, 2002.

[8] 吳智豪, “可撓式溫度感測器陣列”, 國立成功大學工程科學研究所碩士論文(2001) [9] Y.M. Lu , W.S. Hwang , J.S Yang , Effect Of Temperature On The Resistivity Of Non-stoichiometric Sputtered Niox Films, Surface and Coatings Technology 155,pp.231-235, 2002.

[10] I.Hotovy, V.Rehacek, P.Siciliano, S.Capone, L.Spiess, Sensingcharacteristics of NiO thin films as NO2 gas sensor, Thin Solid Films 418, pp.9-15, 2002.

[11] S.R.Jiang, P.X.Yan, B.X.Feng, X.M.Cai, J.Wang, The response of a NiOx thin film to a step potential and its electrochromic mechanism , Materials Chemistry and Physics 77, pp.384-389, 2002.
[12] R.E.Cavicchi,J.S.Suehle,Member,IEEE,K.G.Kreider,M.Gaitan, Member,IEEE,and P.Chaparala, Fast Temperature Programmed Sensing for Micro-Hotplate Gas Sensors, VOL,16,NO.6.JUNE 1995.
[13] H.Kueppers, T.Leuerer, U.Schnakenberg, W.Mokwa, M.Hoffmann, T.Schneller, U.boettger, R.Waser, PZT thin films for piezoelectric microactuator applications, Sensor and Actuators A 97-98, pp.680-684, 2002.