P-061

EFFECT OF THE MICROSTRUCTURE ON THE NO_x AND HUMIDITY SENSING CHARACTERISTICS OF WO_3 THIN-FILM SENSORS

KWANG SOO YOO and YONG JOO OH (Dept. of Mat. Sci. & Eng., Univ. of Seoul, Seoul 130-742, Korea), TAE SONG KIM (Div. of Ceram., Kor. Inst. of Sci. & Tech., Seoul 136-791, Korea)

The nitrogen oxides (NO_x) gases are very hazardous to the human body and thus the importance of NO_x sensors is rising. The sensitivity of NO_x gas exhausted from automobiles using WO_3 thin films has been affected by ambient humidity. In the present study, the microstructure of WO_3 thin films was controlled by depositing at different substrate temperatures (ambient temperature and 300℃, respectively). The WO_3 thin films with 3000Å thickness were deposited on the alumina substrate by using a high-vacuum resistance heating evaporator and annealed at 500℃ in air. Their crystallinity was measured by XRD and the microstructure was observed using SEM. The NO_x gas and humidity sensitivities of the WO_3 thin-film sensors were measured at 200℃ in a hermatically sealed box by a current detection method. The results are also discussed.

P-062

STUDY ON SENSING CHARACTERISTICS OF WO_3 THIN FILMS DEPOSITED BY R.F. SPUTTERING FOR NO_x GAS

YOUNG SOO YOON, TAE SONG KIM, JONG HAK JUNG, KWANG SOO YOO and HYUNG JIN JUNG (Thin Film Technology Research Center, KIST, Seoul 130-650, Korea)

WO_3 thin films were deposited by r.f. sputtering system on polycrystalline Al_2O_3 substrates (unpolished and polished) in order to detect NO_x gas. The as-grown films had various thicknesses, deposition temperatures and annealing temperatures. The as-grown films on the unpolished and polished Al_2O_3 showed higher voltage drop or sensitivity (R_{gas}/R_{air}) at measuring temperature of 200°C and 150°C, respectively than 300°C due to dominant of desorption of NO_x gas at the film surface. The annealing temperature of 600°C for 4hrs made the as-grown film to have highest sensitivity. The as- grown films with the annealing at 600°C on the unpolished Al_2O_3 showed different sensitivity with the deposition temperature. The as-grown films with different film thickness (150, 300, 450 nm) on the polished Al_2O_3 showed almost same sensitivity at the same NO_x concentration. Even though the as-grown WO_3 thin films had high sensitivity, sensing characteristics could be dramatically disturbed by humidity. These results suggested that the WO_3 thin film is very useful for detection of NO_x gas if the disturbance effect of the humidity on the sensing characteristics could be eliminated

P-063

NOx GAS SENSING CHARACTERISTICS OF WO_3 THICK FILM SENSORS FABRICATED UNDER DIFFERENT SINTERING ATMOSPHERE,

YONG K. CHUNG, S. C. CHOI(Dept. of Inorganic Mat. Eng., Hanyang University, Seoul, 133-791, Korea), M. H. KIM, W. S. UM and H. S. LEE(Material Analysis Team, KITECH-KTL, Seoul, 152-053, Korea)

NOx gas sensing characteristics of WO_3 sensors were investigated. WO_3 sensors were fabricated by thick film technique. paste was coated by screen printing method on the alumina substrate($4\times4\times0.4mm^3$) which contained Au electrode and RuO_2 heater on each side and then sensing materials were sintered at 700℃ for 1 hr under different atmosphere which were Ar, O_2, and mixture of Ar/O_2. Sensitivity, response time, and recovery time with different sintering conditions were measured at working temperature range from 70 to 300℃. The initial resistance was increased until Ar/O_2 value is up to 1 and decreased slowly over that value (Ar/O_2=1). The NOx gas sensitivity is increased as Ar/O_2 ratio is adjacent to 1

P-064

Pt-WO_3 MIS CAPACTOR FOR DETECTION OF NO_2 GAS,

J. H. LEE, Y. H. LEE, C. K. KIM (Dept. of Electrical and Electronic Engr, Soonchunhyang Univ., Asan, Choongnam 336-745 Korea) K. S. YOO (Dept. of Materials Science and Engr., University of Seoul, Seoul 130-743, Korea)

Gas sensor utilizing Pt-WO_3 MIS capacitor been explored for NO_2 detection. Pt-WO_3-Si_3N_4-SiO_2- Si-Al capacitor were built on <100> p-type silicon wafers. The silicon wafers were coated with SiO_2 (50Å) and Si_3N_4 (600Å) by conventional silicon processing techniques. Then, a WO_3 layer was subsequently grown by deposition of a 1000Å of W, followed by thermal oxidation at 500℃ for 1 hour. A detection model based on adsorption/desorption of chemisorbed oxygen ions at the Pt-WO_3 interface is proposed for the sensing mechanism. This report presents data on the devices adsorption characteristics, activation energy, and detection mechanism. The catalytic layer of Pt and adsorptive oxide of WO_3 enhance gas sensitivity.

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