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Characteristics of Fine-Structure TiO_2-V_2O_5-Nb_2O_5 Humidity Sensors

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The characteristics of fine-structure TiO_2-V_2O_5-Nb_2O_5 humidity sensors have been investigated as a function of firing temperature and time. Additives and sintering conditions affect the sensor's sensitivity toward humidity. SEM micrographs were taken for the analysis of surface morphology. The TiO_2-V_2O_5-Nb_2O_5 humidity sensor had good linearity in the range from 30%RH to 90%RH and the sensitivity of the sensor sintered at 1000°C for 1 h was 73% at the operating temperature of 30°C. A model of humidity sensors was proposed.

1. Introduction

Recent developments in automated systems have led to ever-increasing demands for various kinds of physical and chemical sensors. Since humidity is a part of our environment, its measurement and control are important not only for human comfort but also for industrial and technological applications.

A humidity sensor which is low in cost and has stable resistance-humidity characteristics was developed by Nitta *et al.*[1] in 1980. The development of other humidity sensors followed thereafter, using ceramic materials such as TiO_2-Nb_2O_5, $MgFe_2O_4$, $ZnCr_2O_4$-$LiZnVO_4$ and Al_2O_3.[2-4]

Titanium oxide has been used as the major material for humidity sensors. Because TiO_2 has a high ability to adsorb O-H radicals, its porosity is easily controlled and it easily transforms anatase into a stable rutile structure at a given sintering temperature.[5] The additives chosen were V_2O_5 and Nb_2O_5 for lowering the resistivity of samples and for