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Effect of K_2HPO_4 Addition on the Humidity Sensitivity of Nb_2O_5-doped TiO_2

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The effect of K_2HPO_4 on the humidity sensitivity of Nb_2O_5-doped TiO_2 ceramics was investigated as a function of the amount of K_2HPO_4 and the firing temperature. As the firing temperature or amount of K_2HPO_4 increased, the grain size and average pore size increased, while the volume of the pores decreased. The humidity sensitivity depended largely on both these microstructures and the presence of $K_4P_2O_7$, which was formed by the decomposition of K_2HPO_4. The samples in which $K_4P_2O_7$ was present were undesirable as humidity sensors because of its hygroscopic nature. Stable humidity sensitivity was observed even at 80°C in the samples in which $K_4P_2O_7$ was absent. TG and IR measurements revealed that this stable sensitivity might be caused by physisorbed water which was barely desorbed at 80°C. These results indicated that humidity at higher temperatures could be readily measured without special procedures such as heat-cleaning.

1. Introduction

Many papers concerning ceramic humidity sensors have been published. These papers revealed that one of the most important factors affecting humidity sensitivity is microstructures such as porosity and pore size distribution.[1,2] The importance of pore structures was also confirmed in Nb_2O_5-doped TiO_2 ceramics.[3] It was thought from the technical point of view that humidity sensors which exhibit stable sensitivi-