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Humidity-Sensitive Properties of Nb_2O_5-Doped Pb(Zr, Ti)O_3

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Humidity-sensitive devices of $Pb(Zr_{0.52}Ti_{0.48})O_3$ + 4 mol% Nb_2O_5 were fabricated and their sensitivity was measured. The change of electrical conductivity with water adsorption is caused by ionic conduction in which the conducting carriers are protons. Humidity sensitivity is affected by the open porosity of the ceramic, and the open porosity and the adsorption rate decrease with increasing sintering temperature. The sensitivity is stable in a wide temperature range, and the hysteresis in one humidity cycle is negligible.

1. Introduction

Humidity sensors utilize the change of electrical parameters with humidity adsorption, and have been made of materials such as electrolytes,[1] organic polymers[2,3] and ceramics. Among them, ceramic humidity sensors form a majority because ceramics are essentially more stable physically, chemically and thermally than other materials.[4–6]

In this study, humidity sensitivity has been investigated in Nb_2O_5-doped Pb(Zr, Ti)O_3 ceramics, which were originally developed as a monomorph device (semicon-