OXYGEN SENSING PROPERTIES AND HOT SPOT TEMPERATURE VARIATION OF $HoBa_2Cu_3O_{7-\delta}$ CERAMIC

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ABSTRACT

OXYGEN SENSING PROPERTIES AND HOT SPOT TEMPERATURE VARIATION OF $HoBa_2Cu_3O_{7-\delta}$ CERAMIC

The oxygen sensing properties and hot spot temperature variation of $HoBa_2Cu_3O_{7-\delta}$ (Ho123) ceramic have been successfully investigated. The mechanism of oxygen sensing and the relationship between temperatures of hot spot and oxygen partial pressure, pO_2 have been studied and explained. The Ho123 rod was prepared by using conventional solid-state reaction method and the current-voltage (I-V) characteristic and temperature dependence were measured by using four-point probe method and pyrometer. The oxygen partial pressures that were selected for measurement are 0%, 20%, 40%, 60%, 80%, and 100% and were controlled by changing the flow rates of O_2 and N_2 while the input voltage was increased by 0.05 V. A hot spot, which is a visible glowing spot, appears in the rod when the current reaches a peak value. The current after the appearance of the hot spot depended strongly on oxygen partial pressure. The results indicated that the relationship between hot spot temperature and oxygen partial pressure is when oxygen partial pressure increases, the temperature of the hot spot increases at all selected voltages which are at 2.35 V, 2.40 V and 2.45 V. The maximum value of hot spot temperature for each oxygen partial pressure are 630.5 °C, 697.6 °C, 729.6 °C, 746.6 °C, 750.6 °C, and 758.4 °C, respectively. The influence of oxygen partial pressure on the hot spot temperature of the sample was suggested to be related to PTCR characteristic of the sample and the orthorhombic-tetragonal structural changes. As the Ho123 sample shows higher sensitivity on lower oxygen concentration, it is suggested as a potential candidate for oxygen sensor.

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