# OXYGEN SENSITIVE HOT SPOT ON $ErBa_2Cu_3O_{7-\partial}$ CERAMICS

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## ABSTRACT

In this paper, $ErBa_2Cu_3O_{7-\delta}$ composite ceramic rods with cross sections of $0.65mm \times 0.65mm$ and various $BaAl_2O_4$ contents were prepared by solid state reaction. A glowing hot spot appeared on the rods when a certain dc voltage was applied at ambient temperature in air and moves to the negative electrodes with the velocity of a few mm per minute. The hot spot appears by self heating of the local part on the $ErBa_2Cu_3O_{7-\delta}$ ceramic rods. The rod with the hot spot shows various functional characteristics that give rise to applications in devices such as an oxygen sensor. The current – voltage characteristics were measured by using a four-point probe method. This sensor operates without any separate heater by taking advantage of the high temperature of the hot spot where oxide ions can diffuse easily. The oxygen concentration is determined from the value of the current flowing through the rods by utilizing the change in resistivity of the hot spot depending on oxygen partial pressure in atmosphere. For the evaluation of the sensing characteristics, the oxygen concentration was changed by using the mixture of oxygen and nitrogen. Oxygen concentrations of 0 to 100% can be detected with high sensitivity and the response time varies with different $BaAl_2O_4$ contents. With the addition of $BaAl_2O_4$, the sensitivity performance of the rods decreases and its response time would increase. The proposed sensor using the hot spot not only has the great advantage of the simple structure but also the response performance of this sensor is almost the same as that of the limiting-current-type oxygen sensor using $ZrO_2$, operating at 500°C.

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