# EFFECTS OF $Pr^{3+}$ SUBSTITUTION ON OXGEN SENSING PROPERTIES OF $Eu(Ba_{1-x}Pr_x)_2Cu_3O_{7-\delta}$ ($x = 0.00 - 0.15$) CERAMIC RODS USING HOT SPOT PHENOMENON

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This Final Year Report entitled **"Effects of $Pr^{3+}$ substitution on oxygen sensing properties of $Eu(Ba_{1-x}Pr_x)_2Cu_3O_{7-\delta}$ ($x$ = 0.00 – 0.15) ceramic rods using hot spot phenomenon"** was submitted by Nurul Fatehah Binti Yusof, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Industrial Physics, in the Faculty of Applied Science, and was approved by

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## ABSTRACT

### EFFECTS OF $Pr^{3+}$ SUBSTITUTION ON OXYGEN SENSING PROPERTIES OF $Eu(Ba_{1-x}Pr_x)_2Cu_3O_{7-\delta}$ ($x = 0.00 - 0.15$) CERAMIC RODS USING HOT SPOT PHENOMENON

In this study, the effects of $Pr^{3+}$ substitution on oxygen sensing properties of $Eu(Ba_{1-x}Pr_x)_2Cu_3O_{7-\delta}$ ($x$ = 0.00 – 0.15) ceramic rods using hot spot phenomenon were reported. The $Eu(Ba_{1-x}Pr_x)_2Cu_3O_{7-\delta}$ ($x$ = 0.00 – 0.15) samples were fabricated using solid state method. The powdered mixtures were grind, calcined and pressed into pellet before being sintered. The pellets were then cut into rods measuring 13 mm x 1 mm x 1 mm. Substitution of $Pr^{3+}$ increases average grain size of samples. No structural changes were observed due to the $Pr^{3+}$ substitution. For substituted ceramic rods, the voltage at which hot spot appeared is lowered. The output current for all samples decreases abruptly after the appearance of hot spot. The sensitiveness to the oxygen partial pressure between 20% and 100% also increase with the substitution of $Pr^{3+}$. The sensitivity increases significantly at higher $pO_2$ concentration (>80%). The stability and repeatability of the samples also improved with $Pr^{3+}$ substitution. From the result, it was found that the substitution of $Pr^{3+}$ at Ba site increases the sensitivity to the oxygen partial pressure.

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