

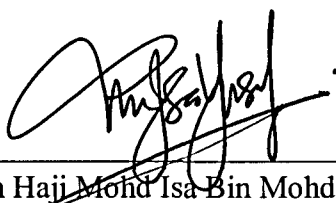
**INVESTIGATION INTO THE EFFECT OF STRUCTURAL
CHANGE ON OXYGEN SENSING PROPERTIES DUE TO HOT
SPOT PHENOMENA OF Pr^{3+} SUBSTITUTED $\text{Eu}(\text{Ba}_{1-x}\text{Pr}_x)_2\text{Cu}_3\text{O}_{7-\delta}$
($x = 0.00, 0.05, 0.25$, and 0.40) CERAMIC RODS.**

MUHAMAD FAIZAL BIN OTHMAN

**Final Year Project Report Submitted in
Partial Fulfillment of the Requirement for the
Degree of Bachelor (Hons.) Industrial Physics
In Faculty of Applied Sciences
Universiti Teknologi MARA**

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This Final Year Project entitled “Investigation Into The Effect of Structural Change on Oxygen Sensing Properties Due to Hot Spot Phenomena of Pr^{3+} Substituted $\text{Eu}(\text{Ba}_{1-x}\text{Pr}_x)_2\text{Cu}_3\text{O}_{7-\delta}$ ($x = 0.00, 0.05, 0.25$ and 0.40) Ceramic Rods” was submitted by Muhamad Faizal Bin Othman, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Industrial Physics, in the Faculty of Applied Sciences, and was approved by



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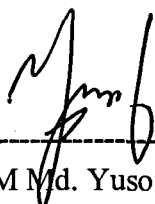
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May Allah SWT bless all of you.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	ix
ABSTRACT	x
ABSTRASK	xi
CHAPTER 1 : INTRODUCTION	
1.1 Introduction	1
1.2 Problem Statement	3
1.3 Significance of study	4
1.4 Objectives	4
CHAPTER 2 : LITERATURE REVIEW	
2.1 Historical Background	5
2.2 Ceramic Superconductor	6
2.3 Perovskite	6
2.3.2 Y-123 Structure	7
2.4 Hot Spot	9
2.4.1 Appearance of hot spot	9
2.4.2 Hot spot phenomena	13
2.4.3 General features of hot spot	14
2.4.4 Relation between current (I) and voltage (V)	15
2.4.5 Relation between resistivity (R) and Temperature (T)	16
2.4.6 Migration of the hot spot	17
2.4.7 Oxygen partial pressure pO_2 defence on current	19
2.4.8 The application of the hot	21
2.5 Sintering process	22
CHAPTER 3: METHODOLOGY	
3.1 Chemical	23
3.2 Equipments	24
3.3 Sample Preparation	25
3.3.1 Preparation of $Eu(Ba_{1-x}Pr_x)_2Cu_3O_{7-\delta}$	26
3.3.2 Calcination Process	28
3.3.3 Pellet	29

ABSTRACT

INVESTIGATION INTO THE EFFECT OF STRUCTURAL CHANGE ON OXYGEN SENSING PROPERTIES DUE TO HOT SPOT PHENOMENA OF Pr^{3+} SUBSTITUTED $\text{Eu}(\text{Ba}_{1-x}\text{Pr}_x)_2\text{Cu}_3\text{O}_{7-\delta}$ ($x = 0.00, 0.05, 0.25$ and 0.40) CERAMIC RODS.

A hot spot which is a local area glowing orange appear in $\text{Eu}(\text{Ba}_{1-x}\text{Pr}_x)_2\text{Cu}_3\text{O}_{7-\delta}$ when a certain voltage is applied to the rod which heats up due to Joule's heating. The effect of structural change and hole concentration due to Pr^{3+} substitution based Eu123 were investigated. In this experiment, the $\text{Eu}(\text{Ba}_{1-x}\text{Pr}_x)_2\text{Cu}_3\text{O}_{7-\delta}$ ($x = 0.00, 0.05, 0.25$, and 0.40) ceramic samples were synthesized using conventional solid state method. The powder were prepared in stoichiometric ratio, mixed and ground. The powders were then calcined and press into pellets and sintered. The pellet was cut into rods that have dimensions of 13 mm x 0.65 mm x 0.65 mm. The structure changes from orthorhombic to pseudo-tetragonal at $x = 0.25$ and $x = 0.40$. The current through the rod decreased abruptly after the hot spot appeared with increasing voltage for samples $x = 0.00$ and $x = 0.05$. However, for the $x = 0.25$ sample showed constant current plateau with increasing voltage and displayed better stability and repeatability compared to $x = 0.00$ and 0.05 samples. In addition, all the samples show increased sensitiveness at lower pO_2 concentration for pO_2 between 20% to 100%. From the result, it is suggested that the structural changes from orthorhombic to tetragonal due to the Pr^{3+} substitution in particular for sample $x \geq 0.25$ resulted in an improved oxygen sensing properties.