## MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF BiFeO<sub>3</sub> CO-DOPING WITH Eu AND La

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

**JULY 2012** 

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#### ACKNOWLEDGEMENT

First and foremost I offer my sincerest gratitude to my supervisors, Encik Rosmamuhamadani bin Ramli and Dr Mahesh Kumar Talari, for their supervision and constant support. Their invaluable help of constructive comments and suggestions throughout the experimental and thesis works have contributed to the success of this research. Not forgotten, to all my lecturers for their support and knowledge regarding this topic.

I would like to thanks to PHD students, Cik Farah Adibah Binti Ali for her kindness and co-operations. Sincere thanks to all my friends for their kindness and moral support during my study. Thanks for the friendship and memories.

Last but not least, my deepest gratitude goes to my beloved parents, Mr. Mostapa Kamal bin Kasmoni and Mrs. Noor Hana Binti Abdul Rashid and also my brothers and my sisters for their endless love, prayers and encouragement. To those who indirectly contributed in this research, your kindness means a lot to me. Thank you very much.

Munirah Binti Mostapa Kamal, 2012

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#### ABSTRACT

### MICROSTRUCTURE AND DIELECTRIC PROPERTIES OF BiFeO<sub>3</sub> CO-DOPING WITH Eu AND La

BiFeO<sub>3</sub> doped with Eu<sub>2</sub>O<sub>3</sub> and La<sub>2</sub>O<sub>3</sub> were prepared by the conventional solidstate reactions method. The effect of La and Eu substitution for the studies on dielectric properties of Bi<sub>1-x-y</sub>Eu<sub>x</sub>La<sub>y</sub>FeO<sub>3</sub> samples (x=0.2; y= 0.1, 0.2) has been studied by performing x-ray diffraction (X-RD), scanning electron microscopy (SEM) and electrical impedance spectroscopy (EIS). The results of prepared samples are compared with pure BiFeO<sub>3</sub> and the single doping of Bi<sub>1-x</sub>Eu<sub>x</sub>FeO<sub>3</sub> samples (x=0.1, 0.15, 0.2). Result showed that the grain size decreasing when the concentration of Bi<sub>1-x-y</sub>Eu<sub>x</sub>La<sub>y</sub>FeO<sub>3</sub> samples is increased. X-ray diffraction (XRD) patterns showed that single phase was formed for all samples. The dielectric constant and the dielectric loss is decreasing as the as the frequency is increase from 1 kHz to 1 MHz at 30°C.

#### CHAPTER 1

#### INTRODUCTION

#### **1.1** Background study

Ferroelectric materials possess a spontaneous polarization that is stable and can be switched hysteretically by an applied electric field; antiferroelectric materials possess ordered dipole moments that cancel each other completely within each crystallographic unit cell. Ferromagnetic materials possess a spontaneous magnetization that is stable and can be swithched hysteretically by an applied magnetic field; antiferromagnetic materials possess ordered magnetic moments that cancel each other completely within each magnetic unit cell (Zhao et al., 2008).

Multiferroic oxides have the unique properties of both ferromagnetism and ferroelectricity in a single crystal. This opens broader applications in transducers, magnetic field sensors and information storage industry. The bismuth ferrite, BiFeO<sub>3</sub> (BFO) is the only material which gives ferroelectricity and antiferromagnetism at room temperature. BiFeO<sub>3</sub> is the only prototype among all other multiferroic oxides which shows both ferromagnetism and ferroelectricity in a single crystal above room temperature. It has ferroelectric Curie temperature,  $T_c = 1143$ K and antiferromagnetic Neel temperature,  $T_N = 643$ K (Scott *et al.*, 2009).