EFFECTS OF $(Ba_{0.6}Sr_{0.4})TiO_3$ DOPING ON DIELECTRIC PROPERTIES OF $CaCu_3Ti_4O_{12}$ (CCTO) CERAMICS

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Final Year Project Report Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science (Hons.) Physics in the Faculty of Applied Sciences, Universiti Teknologi MARA

MAY 2011

This Final Year Project Report entitled **"Effects of $(Ba_{0.6}Sr_{0.4})TiO_3$ Doping on Dielectric Properties of $CaCu_3Ti_4O_{12}$ (CCTO) Ceramics"** was submitted by Ezlin Elyana Yusof, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Science, and was approved by

19/5/11

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ACKNOWLEDGEMENTS

First and foremost, my utmost gratitude to Prof. Dr. Ahmad Kamal Hayati Yahya, my supervisor for all his guidance and support from the beginning to the final level in developing this research works. His time, patience and consideration shall I never forget. I would also like to thank Miss Norezan Ibrahim as my co-supervisor for her encouragement and valuable insights she has shared to complete this study. All of her suggestion and help are honestly appreciated. To my dear parents, Yusof bin Jamaludin and Baha binti Man whose endlessly supporting me spiritually throughout my life. In addition, a warm thank to my siblings, Ezri Norzaidi Yusof, Emira Syazana Yusof, Edina Zayani Yusof and Ezam Syamir Yusof for their love and support. My appreciation also goes to the members of B. Sc. (Hons.) Physics for all their pleasant help throughout the course of this study. Last but not least, for the one above us all, The Al-Mighty Allah, for giving me the opportunity to be in this excellent world of science, and able to keep me strong in this field. Thank you.

TABLE OF CONTENTS

ABSTRACT

EFFECTS OF $(Ba_{0.6}Sr_{0.4})TiO_3$ DOPING ON DIELECTRIC PROPERTIES OF $CaCu_3Ti_4O_{12}$ (CCTO) CERAMICS

The doping effects of $(Ba_{0.6}Sr_{0.4})TiO_3$ (BST) on dielectric properties of $CaCu_3Ti_4O_{12}$ (CCTO) ceramics were identified. As an oxide ceramics that exhibit very large dielectric constant, the CCTO ceramic had became more favourable than the common ferroelectric materials. Its broad application in various electronic devices had recently attracted strong scientific interests. However, such material also undesirably displayed relatively high in dielectric loss making it is quite unusable. Therefore, the doping process of BST was aimed to reduce the dielectric loss of CCTO. The ceramics were prepared by solid-state reaction method and undergone sintering process at 1100°C for 12 hours. Three sample characterizations were done including X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Electrical Impedance Spectroscopy (EIS) measurements. The variation of dielectric constant with dopant composition is explained by the Lichtenecker's logarithmic law as the samples show decreasing trends of dielectric constant with increase of BST. According to the IBLC model, successful reduction in dielectric loss of CCTO is attributed to the increase of grain boundary resistivity with increase of BST. Over the dopant compositions, the optimum volume ratio for large dielectric constant is found in the x=0.3 sample while x=0.4 sample exhibit very low dielectric loss of CCTO. Thus this indicates that certain BST dopant can be successfully used to improve the dielectric properties of CCTO.