

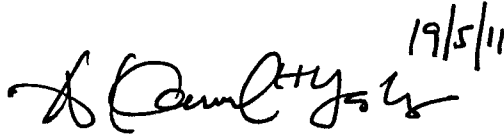
**EFFECTS OF $(\text{Ba}_{0.6}\text{Sr}_{0.4})\text{TiO}_3$ DOPING ON DIELECTRIC
PROPERTIES OF $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO) CERAMICS**

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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**

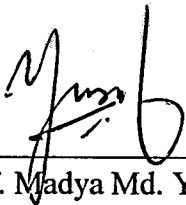
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This Final Year Project Report entitled “Effects of $(\text{Ba}_{0.6}\text{Sr}_{0.4})\text{TiO}_3$ Doping on Dielectric Properties of $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO) Ceramics” was submitted by Ezlin Elyana Yusof, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Science, and was approved by



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ABSTRACT

EFFECTS OF $(\text{Ba}_{0.6}\text{Sr}_{0.4})\text{TiO}_3$ DOPING ON DIELECTRIC PROPERTIES OF $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO) CERAMICS

The doping effects of $(\text{Ba}_{0.6}\text{Sr}_{0.4})\text{TiO}_3$ (BST) on dielectric properties of $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO) ceramics were identified. As an oxide ceramics that exhibit very large dielectric constant, the CCTO ceramic had become 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.