

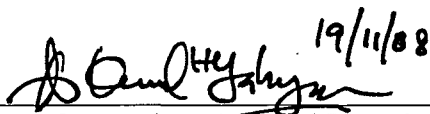
**SYNTHESIS AND STRUCTURE OF  $Tl_{1-x}Cu_xSr_{1.6}Yb_{0.4}CaCu_2O_{7-\delta}$   
( $x = 0.0-0.6$ ) SUPERCONDUCTORS**

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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 Malaysia**

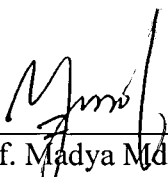
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This final year Project Report entitled “Synthesis and structure of  $Tl_{1-x}Cu_xSr_{1.6}Yb_{0.4}CaCu_2O_{7-\delta}$  ( $x = 0.0-0.6$ ) Superconductors” was submitted by Siti Azwani Yaacob, in partial fulfillment of the requirement for the degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Sciences, and was approved by

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## ABSTRACT

### SYNTHESIS AND STRUCTURE OF $Tl_{1-x}Cu_xSr_{1.6}Yb_{0.4}CaCu_2O_{7-\delta}$ ( $x=0.0-0.6$ ) SUPERCONDUCTORS

In this project, the effects of Cu substitution for Tl in TlSr1212 superconductors have been investigated. The samples have been prepared with nominal starting compositions of  $Tl_{1-x}Cu_xSr_{1.6}Yb_{0.4}CaCu_2O_{7-\delta}$  ( $x=0.0-0.6$ ) using conventional solid state synthesis method and under normal pressure technique. XRD analysis of  $Tl_{1-x}Cu_xSr_{1.6}Yb_{0.4}CaCu_2O_{7-\delta}$  ( $x=0.0-0.6$ ) series showed 1212 phase as major phase. Temperature dependent electrical resistance measurements on the series showed that the normal state behavior and superconducting properties can be controlled by adjusting Cu concentration to achieve maximum critical temperature ( $T_c$ ). The best superconducting behavior of the series was observed for  $Tl_{0.7}Cu_{0.3}Sr_{1.6}Yb_{0.4}CaCu_2O_7$  with zero critical temperature ( $T_{c\ zero}$ ) of 80 K and onset of superconductivity ( $T_{c\ onset}$ ) of 95 K. Superconducting fluctuation behavior has been studied in samples of Cu-substituted  $Tl_{1-x}Cu_xSr_{1.6}Yb_{0.4}CaCu_2O_{7-\delta}$  ( $x=0.0-0.3$ ) by electrical resistivity measurements. Analysis of excess conductivity behavior based on Aslamazov-Larkin (AL) theory revealed transition from 2-D to 3-D behavior of the superconducting fluctuation in the mean field region  $-4 < \ln \varepsilon < -2$  for sample with Cu content ( $x=0.0-0.3$ ). The behavior of superconducting fluctuation constant (AL) both 2D and 3D are similar with the amount of Cu substitution and achieve maximum at amount of Cu content ( $x=0.1$ ) respectively.