

**EFFECTS OF Nb SUBSTITUTION AT Cu SITE ON
SUPERCONDUCTIVITY AND STRUCTURAL PROPERTIES OF
 $\text{Tl}_{0.9}\text{Cr}_{0.1}\text{Sr}_2\text{Ca}_{0.95}\text{Ge}_{0.05}\text{Cu}_{2-x}\text{Nb}_x\text{O}_{7-\delta}$ ($x = 0 - 0.2$)
SUPERCONDUCTORS**

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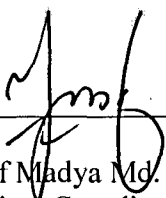
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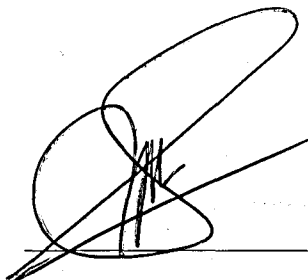
This Final Year Project Report entitled “Effects of Nb Substitution at Cu Site on Superconductivity and Structural Properties of $Tl_{0.9}Cr_{0.1}Sr_2Ca_{0.95}Ge_{0.05}Cu_{2-x}Nb_xO_{7-\delta}$ ($x = 0 - 0.2$) Superconductors” was submitted by Muliana Binti Ismail, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Science, and was approved by



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ABSTRACT

The effects of Cu substitution by Nb on superconductivity and structural properties of $\text{Tl}_{0.9}\text{Cr}_{0.1}\text{Sr}_2\text{Ca}_{0.95}\text{Ge}_{0.05}\text{Cu}_{2-x}\text{Nb}_x\text{O}_{7-\delta}$ ($x=0-0.2$) were investigated. The sample was prepared by using conventional solid-state synthesis method with different concentration of Niobium ($\text{Nb} = 0, 0.05, 0.1, 0.15, 0.2$). X-ray diffraction (XRD) measurement showed formation of dominant 1212 phase and minor 1201 phase. The substitution also caused the c -lattice parameter to decrease from 12.118 \AA to 12.095 \AA with Nb content. Electrical resistivity measurements showed all samples exhibit metallic normal state behavior with zero resistivity critical temperature, $T_{c \text{ zero}}$ increasing from 88.6 K ($x=0$) to 89.6 K ($x=0.05$) before decreasing to 88.1 K ($x=0.2$). The best superconducting behavior was observed at $x=0.05$ with $T_{c \text{ zero}}$ of 89.6 K and $T_{c \text{ onset}}$ of 101.6 K respectively. The average grain size of the samples were almost constant around $4\text{-}6 \mu\text{m}$. The effect of Nb substitution is discussed in term of decreasing c -lattice parameter, average Copper valence and formation of CuO_2 mixed plane which enhanced the superconducting temperature.