EFFECTS OF Mg SUBSTITUTION AT Sr SITE ON SUPERCONDUCTIVITY OF
Tl_{0.5}Pb_{0.5}Sr_{2-x}Mg_{x}Ca_{0.8}Yb_{0.2}Cu_{2}O_{7-d} (x=0.0-1.0)
CERAMICS

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This Final Year Project Report entitled "Effects of Mg substitution at Sr site on superconductivity of $\text{Tl}_{0.5}\text{Pb}_{0.5}\text{Sr}_{2-x}\text{Mg}_x\text{Ca}_{0.5}\text{Yb}_{0.2} \text{O}_{7-\delta}$ $(x=0.0-1.0)$ ceramics" was submitted by Suhadir Shamsuddin, 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

EFFECTS OF Mg SUBSTITUTION AT Sr SITE ON SUPERCONDUCTIVITY OF Tl_{0.5}Pb_{0.5}Sr_{2-x}Mg_xCa_{0.8}Yb_{0.2}Cu_{2}O_{7-δ} (x=0.0-1.0) CERAMICS

In this project, Mg substituted Tl1212 type phase high temperature superconductor with nominal starting compositions of Tl_{0.5}Pb_{0.5}Sr_{2-x}Mg_xCa_{0.8}Yb_{0.2}Cu_{2}O_{7-δ} (x=0.0-1.0) were synthesized using conventional solid-state synthesis method. Power X-ray diffraction (XRD) patterns showed all samples consist of major 1212 phase and minor 1201 phase. Temperature-dependent resistance measurement on (x=0.0) showed metallic normal state behavior. Substitution of Mg caused deterioration of superconductivity and gradual change of normal state resistance from semi-metallic behavior (x=0.2-0.8) to semiconductor-like behavior (x=1.0). The (x=1.0) sample was non-superconducting. The best superconducting behavior of the series was observed for Tl_{0.5}Pb_{0.5}Sr_{2}Ca_{0.8}Yb_{0.2}Cu_{2}O_{7} with $T_c_{\text{zero}}$ and $T_c_{\text{onset}}$ are 92K and 103K respectively. Results of critical temperature ($T_c$) measurements, microstructure investigation using scanning electron microscope (SEM) and power X-ray diffraction (XRD) analysis are presented. The effects of Mg substitution are discussed in terms of lattice parameter which is decrease on both $a$-lattice and $c$-lattice parameter and the concepts of an average Cu valence as well as the changing in normal state behavior.