# SYNTHESIS AND CHARACTERIZATION OF MgCuZn FERRITES BY CO-PRECIPITATION AND MIXED OXIDE ROUTE

CHIN CHEE LUNG

SUPERVISED BY:
DR. IBRAHIM HENK METSELAAR
ASSOCIATE PROFESSOR DR ISKANDAR IDRIS YAACOB

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UNIVERSITY OF MALAYA
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# *DEDICATION*

This dissertation is dedicated to my beloved

Siew Choo and Family

# *ABSTRACT*

MgCuZn ferrites are very important in multilayer chip inductors, which are developed by thick film and co-firing technologies. Silver has been selected as internal conductors for multilayer chip inductors due to the high conductivity and low cost. However, the melting point of silver is 961°C. Therefore, the maximum sintering temperature that can be used in ferrites processing is 950°C to prevent the silver from melting.

The selected stoichiometric composition is $Mg_{0.36}\,Cu_{0.24}\,Zn_{0.4}\,Fe_2O_4$. The MgCuZn ferrites have been synthesized by a co-precipitation process and a mixed oxide route. The purpose for this research is to make a comparison and selection for the best processing route yielding the optimum properties. Also, the effect of different calcination and sintering temperatures on the properties of ferrites has been investigated.

Generally, characterization (TGA, XRD, SEM and particle size distribution), densification (density measurement) and electromagnetic properties (initial permeability, Quality factor, AC and DC resistivity and loss factor) have been done to investigate the characteristics and properties of MgCuZn ferrites.

For MgCuZn ferrites synthesized by co-precipitation process, specimens with a calcination temperature of 650°C and a sintering temperature of 930°C possess the optimum properties. Whereas, for MgCuZn ferrites synthesized by mixed oxide route, specimens with a calcination temperature of 850°C and a sintering temperature of 950°C possess the optimum properties.

Overall, MgCuZn ferrites synthesized by both co-precipitation process and mixed oxide route achieve approximately the same range of densification. However, MgCuZn ferrites prepared by mixed oxide route shows higher initial permeability

and lower loss factor as compared to co-precipitation process. The trend for quality factor and AC electrical resistivity in specimens prepared by both co-precipitation process and mixed oxide route were varied according to the frequency range.

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CHIN CHEE LUNG

Post Graduate Student

Department of Mechanical Engineering

2002 – 2004

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