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

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A DISSERTATION SUBMITTED FOR THE
MASTER OF ENGINEERING SCIENCE

DEPARTMENT OF MECHANICAL ENGINEERING
FACULTY OF ENGINEERING
UNIVERSITY OF MALAYA
KUALA LUMPUR

OCTOBER 2004



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.

ACKNOWLEDGEMENT

First and foremost, I would like to express my gratitude to the Department of Mechanical Engineering, University of Malaya (Kuala Lumpur) for providing me with this opportunity to do this research (dissertation).

I would like to take this opportunity to express my deepest thanks to my supervisor, Dr. Ibrahim Henk Metselaar and Associate Prof. Dr. Iskandar Idris Yaacob for their invaluable guidance and advice throughout the research. Also, I would like to thank Associate Prof. Dr. Teh Ser Kok (Former lecturer from Department of Mechanical Engineering, University of Malaya) for his guidance and encouragement.

Special thanks to my dear friends, Miss Koay Mei Hye and Mr. Lai Mun Kou, provided support, helpful suggestion and caught some errors that I completely overlooked.

I would like to thank all the laboratory assistance, especially Mr. Said and Mr. Ismail (Department of Mechanical Engineering, University of Malaya), who have provided valuable assistance and help in using the testing equipment.

Lastly, I would like to express my sincere appreciation to my family members, Miss Sim Siew Choo and friends for their encouragement and support throughout the research (dissertation).

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2002 – 2004

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