



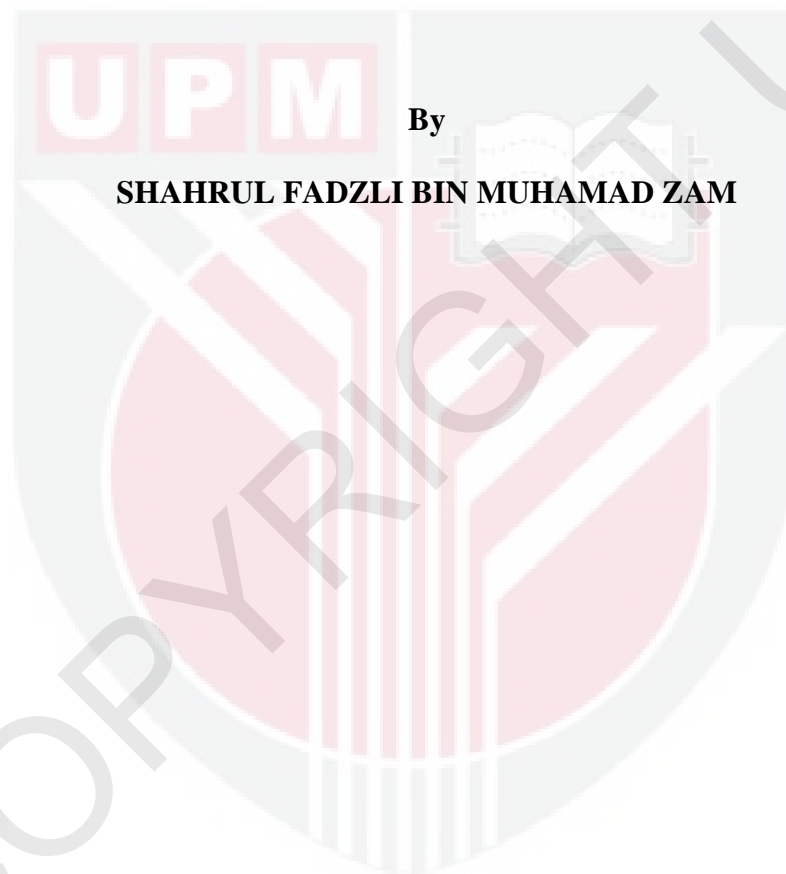
UNIVERSITI PUTRA MALAYSIA

***BISMUTH-ANTIMONY AS AN ALTERNATIVE MATERIAL FOR HIGH
TEMPERATURE LEAD-FREE SOLDER***

SHHRUL FADZLI BIN MUHAMAD ZAM

FK 2012 5

**BISMUTH-ANTIMONY AS AN ALTERNATIVE MATERIAL FOR HIGH
TEMPERATURE LEAD-FREE SOLDER**



By

SHHRUL FADZLI BIN MUHAMAD ZAM

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Master of Science**

March 2012

Dedicated to,

My beloved father and mother,

*Muhamad Zam Bin Abdul Rahman and Peridah Binti Shamsudin,
Who has always been my epitome of love and strength.*

My beloved sibling,

*Syamsul, Suhairi & Sahira
Thanz for your supports.*

My fiancé who has been very understanding and helpful,

*Nurul Ezaty Bin Mohd Nasarudin
Your support and hope that I always remembered.*

*Friend and partner that always together during this one and half years study,
Hopefully achieved what we aspired.*

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(Al-Quranul Kareem: 2:286)

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Faculty : Engineering

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

BISMUTH-ANTIMONI SEBAGAI SATU BAHAN ALTERNATIF UNTUK PATERI TANPA PLUMBUM BERSUHU TINGGI

Oleh

SHAHRUL FADZLI BIN MUHAMAD ZAM

Mac 2012

Penyelia : Azmah Hanim Binti Mohamed Ariff, PhD

Fakulti : Kejuruteraan

Pembangunan pateri tanpa plumbum bersuhu tinggi merupakan antara perkara utama yang dibincangkan kini. Bagi menggantikan pateri berplumbum bersuhu tinggi yang terdapat sekarang, ia merupakan cabaran yang besar. Di dalam sektor pemasangan elektronik, pemilihan bahan pateri tanpa plumbum bersuhu tinggi perlu mempunyai kriteria-kriteria seperti mempunyai suhu lebur dalam lingkungan 260°C hingga 400°C, pengembangan jumlah isipadu yang kecil semasa proses pateri yang tidak merosakkan bungkusan dan mempunyai julat plastik yang kecil. Di antara contoh pateri tanpa plumbum bersuhu tinggi pada masa kini ialah Sn-Sb, Au-Sn, Bi-Ag, Cu-Sn dan lain-lain. Namun, kebanyakan aloi yang telah dikaji kurang menepati kriteria pateri tanpa plumbum bersuhu tinggi. Secara keseluruhannya, kebanyakan alternatif untuk pateri tanpa plumbum menggunakan komponen timah. Pelbagai usaha telah dibangunkan dan sistem pateri Bi(Bismut)-Sb(Antimoni) terbukti sebagai salah satu calon yang sesuai untuk pemasangan elektronik. Melalui penyelidikan ini, aloi pateri 95Bi-5Sb, 97.5Bi-2.5Sb dan 98.5Bi-1.5 pada awalnya

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ACKNOWLEDGEMENT

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I certify that a Thesis Examination Committee has met on xx/x/2012 to conduct the final examination of **Shahrul Fadzli Bin Muhamad Zam** on his thesis entitled "**Bismuth-Antimony As An Alternative Material For High Temperature Lead Free Solder**" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science (Materials Engineering).

Members of the Thesis Examination Committee were as follows:

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BUJANG BIN KIM HUAT, PhD

Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

I declared that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



SHAHRUL FADZLI BIN MUHAMAD ZAM

Date: 29 March 2012

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SHahrul FadZli Bin Muhamad Zam

Date: 29 March 2012

TABLE OF CONTENTS

	Page
DEDICATION	ii
ABSTRACT	iii
ABSTRAK	v
ACKNOWLEDGEMENTS	vii
APPROVAL	ix
DECLARATION	xi
LIST OF TABLE	xv
LIST OF FIGURE	xvii
ABBREVIATION	xxii
CHAPTER	
1	
INTRODUCTION	
1.1 Background of the Research	1
1.2 Problem Statement	2
1.3 Objectives of Research	6
1.4 Scopes of Research	6
1.5 Importance of Research	7
2	
LITERATURE REVIEW	
2.1 Introduction	8
2.2 Electronic Packaging and Levels	8
2.3 Interconnection	10
2.3.1 Wire Bonding	12
2.3.1.1 Wire bonding process	14
2.3.1.2 Limitation of wire bonding	15
2.3.2 Tape automated bonding	15
2.3.3 Flip Chip	16
2.3.3.1 Flip chip process	17
2.3.3.2 The realibility of flip chip	19
2.3.3.3 Reflow Soldering (Advantages)	19
2.3.3.4 Suggested Thermal Profile for Soldering Process	21
2.4 High Temperature Solder	23
2.5 High Temperature Leaded Solder	24
2.6 Lead Free Solder Candidates	25
2.7 Lead Free Solder Phase Diagram: Available Phase Equilibria Information for Candidate Solders	29

	2.7.1	Alloys Binary System	29
	2.7.2	Ternary and Higher Component Systems (Ternary Solder to Cu Substrate)	31
2.8		Realibility of Bi-Sb As Alternative Lead Free Solder	33
	2.8.1	Solder Joint Formation	34
	2.8.2	Intermetallic Compound (IMC)	36
	2.8.3	Microstructure and Interfacial Reaction of Bi-Sb between Cu Substrate	37
		2.8.3.1 Ostwald Ripening Mechanism	38
		2.8.3.2 Mechanical Grain Boundary Grooving	45
		2.8.3.3 Interface Reaction by Copper Dissolution	47
	2.8.4	Melting Temperature and Phase Composition for Bi-Sb Alloys High Temperature Lead Free Solder	49
	2.8.5	Mechanical Properties of Bi and Sb	51
		2.8.5.1 Ductility	51
	2.8.6	Solderability	53
3		METHODOLOGY	
3.1		Introduction	58
3.2		Stage 1: Materials Selection and Development	58
3.3		Stage 2: Samples Preparation	60
	3.3.1	Produce Solder Rods/Pellet	60
	3.3.2	Chemical Cleaning of Bare Copper Board	62
	3.3.3	As Reflow and Multiple Reflow Soldering	64
	3.3.4	Cold Mounting, Grinding and Polishing the Samples	65
		3.3.4.1 Cold Mounting Samples Preparation	65
		3.3.4.2 Grinding the Samples	66
		3.3.4.3 Polishing the Samples	68
3.4		Stage 3: Samples Characterization and Analysis	70
	3.4.1	Characterization by Cross Section	71
	3.4.2	Identification of IMC Phases through SEM/EDX Results	73
	3.4.3	SEM-EDX Specification	76
	3.4.4	Intermetallic Compound (IMC) Calculation	78
4		RESULT AND DISCUSSION	
4.1		Introduction	79
4.2		Differential Scanning Calorimetry (DSC) Results	80
	4.2.1	Melting Temperature of 95Bi-5Sb Solder	80

	Alloy	
	4.2.2 Melting Temperature of 97.5Bi-2.5Sb Solder Alloy	81
	4.2.3 Melting Temperature of 98.5Bi-1.5Sb Solder Alloy	82
	4.2.4 Melting Temperature Comparison	83
4.3	Characterization of Solder Alloys after As Reflow Soldering Reaction	85
4.4	Characterization of Solder Alloys after Second Reflow Soldering Reaction	97
4.5	Characterization of Solder Alloys after Third Reflow Soldering Reaction	101
4.6	Comparison of IMC Formed for 95Bi-5Sb Solder Alloy Different Types of Reflow	105
4.7	Thickness Comparison of Mechanical Grain Boundary Grooving for 97.5Bi-2.5Sb and 98.5Bi-1.5Sb Solder Alloy	109
4.8	Length of Cu Rich Phase in Solder Bulk Analysis on Different Type of Reflow	115
4.9	Wetting Angle of Solder Alloys	121
5	CONCLUSION AND RECOMMENDATION	
5.1	Conclusion	125
	5.1.1 Bi-Sb Melting Temperature	125
	5.1.2 Interfacial Reaction by Different Reflow Stages	126
	5.1.3 Interfacial Thickness Analysis	127
	5.1.4 Length of Cu Rich Phase in Solder Bulk Analysis	127
	5.1.5 Wetting Angle of Solder Alloys	128
5.2	Recommendation	128
	REFERENCES	130
	BIODATA OF STUDENT	135
	LIST OF PUBLICATION	136