

TABLE OF CONTENT		PAGE
	ABSTRACT	ii
	ACKNOWLEDGEMENT	iii
	CONTENTS	iv
	LIST OF FIGURES	vii
	LIST OF TABLES	ix
	LIST OF SYMBOL	x
CHAPTER		
1	INTRODUCTION	1
	1.1 Background of study	1
	1.2 Objectives of study	3
	1.3 Scope of study	3
	1.4 Approach of study	4
2	LITERATURE REVIEW	7
	2.1 Introduction to Taguchi parametric robust design	7
	2.2 Previous works that used the Taguchi method	9
	2.3 Introduction to powder metallurgy	11
	2.3.1 Blending or mixing	11
	2.3.2 Compaction	12
	2.3.3 Sintering	13
	2.4 Introduction to Microwave Heating	14
	2.4.1 Microwave heating mechanism	15
	2.4.1.1 Dipolar polarization mechanism	17
	2.4.1.2 Ionic conduction mechanism	18
	2.4.1.3 Interfacial Polarization	19
	2.5 Previous works on microwave sintering	19
3	METHODOLOGY	26
	3.1 Selection of material design	26
	3.2 Fixed Parameters	28
	3.3 Controllable Variable Parameters	28

3.3.1	Sintering temperature	29
3.3.2	Sintering time	29
3.3.3	Sintering atmosphere	29
3.3.4	Compaction pressure	30
3.4	Uncontrollable Variable Parameters	30
3.5	Experimental Condition	31
3.6	Experimental Procedure	33
3.6.1	Powder preparation	33
3.6.2	Powder Mixing	34
3.6.3	Powder Compaction	35
3.6.4	Sintering	37
3.6.5	Measurements	39
3.6.5.1	Dimensional Changes	39
3.6.5.2	Density	40
3.6.5.3	Porosity	41
3.6.5.4	Vickers Hardness Test	43
3.6.5.5	Microstructure Studies	43
4	DESIGN, FABRICATION AND PERFORMANCE STUDY OF EXPERIMENTAL MICROWAVE SINTERING SETUP	44
4.1	Selection of microwave oven	44
4.2	General design of the modification of microwave oven	46
4.3	Installation of fibre blanket	48
4.4	Installation of alumina protection tube and thermocouple	49
4.5	The making of fibre cube	51
4.6	Modification of electronic circuit and installation of temperature controller	55
4.7	Testing of overall system	57
4.8	Temperature fluctuation	60
5	RESULTS, DATA ANALYSIS AND DISCUSSION	63
5.1	Physical Appearance	63
5.2	Dimensional changes	65
5.3	Density	68
5.3.1	The effect of input parameters on density	69
5.3.2	Density ratio	72
5.3.3	Densification parameter	73
5.3.4	Pareto ANOVA	74
5.4	Open pores porosity	79
5.4.1	The effect of input parameters on porosity	80

5.4.2 Pareto ANOVA	82
5.5 Vickers Hardness Test	86
5.5.1 The effect of input parameters on hardness	87
5.5.2 Pareto ANOVA	89
5.6 Microstructures	94
6 CONCLUSIONS AND RECOMMENDATIONS	103
6.1 Conclusions	103
6.2 Recommendations	105
REFERENCES	106
APPENDIX A	
Raw Data	109
APPENDIX B	
Microwave Oven Technical Specification	119