CONTENTS

CHAPTER- I	INTRODUCTION	1
1.1	HISTORICAL	1
1.2	STRUCTURE OF FERRITE MATERIALS	3
1.2.1	Chemical structure of ferrites	. 3
1.2.2	Lattice structure of ferrites	4
1.3	CLASSIFICATION OF FERRITES	6
1.3.1	Normal spinel ferrites	7
1.3.2	Inverted spinel ferrites	'7
1.3.3	Random spinel ferrites	8
1.3.4	Substitutional ferrites.	8
1.4	PROPERTIES OF FERRITES	9
1.5	APPLICATIONS OF FERRITES	12
1.6	ORIENTATION OF THE PROBLEM	14
	REFERENCES	17
CHAPTER-II	PREPARATION AND CHARACTERIZATION OF FERRITE SAMPLES	20
PART-A	PREPARATION OF FERRITE SAMPLES	20
2.1	INTRODUCTION	20
2.2	MECHANISM OF SOLID STATE REACTION	21
2.3	PREPARATION OF FERRITES	22

	2.3.1	Methods of preparation of ferrite composition	22
	[a]	Oxide Method	24
	[b]	Decomposition Method	24
	[0]	Hydroxide Method	24
	[d]	Oxalate Method	25
	2.3.2	PRE SINTERING	25
	2.3.3	Powdering and Pressing	26
	2.3.4	Sintering	26
	3.4	HOT PRESSING	27
	3.5	ACTUAL PREPARATION OF FERRITE SAMPLES	28
	[a]	General Formula	28
	[b]	Starting Materials	28
	[c]	Weighing	28
	[d]	Pre sintering	28
	[e]	Pellet formation	29
	[f]	Final sintering	29
	PART-B	CHARACTERIZATION OF FERRITE SAMPLES BY X.R.D. TECHNIQUE	30
	2.6	INTRODUCTION	30
	2.7	X-RAY DIFFRACTION	30
٠	[a]	Laue Method	31
	[b]	Rotating Crystal Method	31
	[c]	Powder Method	32
,	2.8	EXPERIMENTAL	94
	2.9	INDEXING DIFFRACTION MAXIMA AND	34

•

.

·

	2.10	RESULTS AND DISCUSSIONS	35
		REFERENCES	59
	CHAPTER-III	ELECTRICAL CONDUCTIVITY	61
	3.1	INTRODUCTION	61
	3.2	CONDUCTIVITY MODELS AND CONDUCTIVITY IN FERRITES	61
	3.3	PROBLEMS OF CONDUCTIVITY IN FERRITES	64 ,
	3.4	CONDUCTION BY POLARONS	65
	3.5	ACTIVATION ENERGY	66
	3.6	TEMPERATURE DEPENDENCE OF RESISTIVITY	67
	3.7	EXPERIMENTAL	68
	3.8	RESULTS AND DISCUSSION	72
	3.8.1	Composition dependence of electrical conductivity	72
	3.8.2	Temperature dependence of electrical conductivity	74
	3.8.3	Effect of porosity and sintering time on electrical conductivity	77
		REFERENCES	88
	CHAPTER-IV	MAGNETIZATION AND IR STUDIES	91
	PART-A	MAGNETIZATION OF Co-Zn FERRITES	91
	4.1	INTRODUCTION	91
•	4.2	MAGNETIZATION IN FERRITES	92
	4.3	ANISOTROPY	96
	4.4	DOMAINS IN FERROMAGNETICS	96
	4.5	MAGNETIC HYSTERESIS	98

	4.6	NEEL'S THEORY OF FERRIMAGNETISM	101
·	4.6.1	NEEL'S assumptions and concepts	102
	4.6.2	Ferrimagnetic Behaviour	104
	4.6.3	Anti-ferromagnetic Behaviour	105
	4.6.4	Para magnetic Behaviour	105
	4.7	EXPERIMENTAL.	110
	4.7.1	Description of the apparatus	110
	4.7.2	Measurement Procedure	112
	4.8	RESULTS AND DISCUSSION	114
	4.3.1	Effect of Zn-composition and sintering time on $M_{\mbox{\scriptsize S}}$ and $\mu_{\mbox{\scriptsize B}}$	114
	4.8.2	Cation distribution and magnetic moment	121
	PART-B	FAR INFRARED SPECTRA OF Co _x Zn _{1-x} Fe ₂ O ₄ FERRITES.	126
	4.9	INTRODUCTION	126
	4.10	EXPERIMENTAL	127
	4.11	RESULTS AND DISCUSSION	127
		REFERENCES	136
CHAPTER- V		FERRITE MICROSTRUCTURE	140
	5.1	INTRODUCTION	140
	5.2	MICROSTRUCTURE AND FERRITES	141
	5.3	DEVELOPMENT OF MICROSTRUCTURE DURING SINTERING	142
	5.3.1	Control of grain size	145
	5.3.2	Control of Porosity	150
	5.4	QUANTITATIVE MICROSCOPY OR STERIOLOGY	151

•

5.5	EXPERIMENTAL	154
5.6	RESULTS AND DISCUSSION	155
	REFERENCES	162
CHAPTER-VI	SUMMARY AND CONCLUSIONS	164
	REFERENCES	175