

TABLE OF CONTENTS

Chapter No	Title	Page No
1	INTRODUCTION TO NANOMATERIALS AND NANOFERRITES	1-23
1.1	Nanotechnology and nanomaterials	1
1.1.1	Properties of nanomaterials	2
1.1.2	Preparation of nanomaterials	5
1.1.2.1	Bottom-up approach	5
1.1.2.2	Top-down approach	7
1.1.3	Applications of nanomaterials	8
1.2	Nanoferrites	10
1.2.1	Properties of nanoferrites	10
1.2.2	Structure of spinel ferrites	11
1.2.3	Synthesis of nanoferrites	13
1.2.4	Applications of nanoferrites	14
1.3	Literature studies	17
1.4	Scope of the present work	21
2	CHARACTERIZATION TECHNIQUES AND INSTRUMENTATION	24-40
2.1	Introduction	24
2.2	Characterization techniques	24

2.3	Instrumentation details	25
2.3.1	Powder X-Ray Diffraction	25
2.3.2	High Resolution Transmission Electron Microscope	28
2.3.3	Scanning Electron Microscope	31
2.3.4	Fourier Transform Infrared spectroscope	33
2.3.5	UV-Visible spectroscope	35
2.3.6	Vibrating Sample Magnetometer	36
2.3.7	Dielectric measurement	38
3	SYNTHESIS AND CHARACTERIZATION OF MAGNESIUM MANGANESE NANOFERRITES ($Mg_{0.5}Mn_{0.5}Fe_2O_4$)	41-68
3.1	Introduction	41
3.2	Materials and methods	42
3.2.1	Synthesis	42
3.2.2	Characterization studies	43
3.3	Results and discussions	44
3.3.1	Structural and morphological analysis	44
3.3.2	Optical studies	55
3.3.3	Magnetic studies	59
3.3.4	Electrical studies	61
3.4	Conclusions	68
4	PREPARATION AND ANALYSIS OF ZINC MANGANESE FERRITE ($Zn_{0.5}Mn_{0.5}Fe_2O_4$) NANOPARTICLES	69-88
4.1	Introduction	69

4.2	Preparation	70
4.3	Results and discussion	70
4.3.1	Powder X-ray diffraction studies	70
4.3.2	HRTEM analysis	73
4.3.3	SEM analysis	76
4.3.4	FTIR characterization	77
4.3.5	UV-Vis studies	78
4.3.6	Magnetic studies	80
4.3.7	Dielectric studies	82
4.3.8	AC conductivity studies	86
4.4	Conclusion	87
5	SYNTHESIS AND ANALYSIS OF COPPER MANGANESE FERRITE ($\text{Cu}_x\text{Mn}_{1-x}\text{Fe}_2\text{O}_4$, $X=0, 0.25, 0.5, 0.75, 1$) NANOCRYSTALLITES	89-118
5.1	Introduction	89
5.2	Sample preparation	90
5.3	Results and discussion	90
5.3.1	PXRD studies	90
5.3.2	TEM analysis	97
5.3.3	SEM analysis	97
5.3.4	FTIR analysis	101
5.3.5	UV-Vis studies	103

5.3.6	Magnetic studies	106
5.3.7	Dielectric studies	109
5.4	Conclusions	118
6	SYNTHESIS AND STUDIES ON Al^{3+} IONS MIXED COPPER MANGANESE($Cu_{0.5}Mn_{0.5}Al_{0.5}Fe_{1.5}O_4$)NANOFERRITES	119-137
6.1	Introduction	119
6.2	Synthesis	120
6.3	Results and discussions	120
6.3.1	Structural and morphological analysis	120
6.3.2	Optical studies	127
6.3.3	Magnetic studies	129
6.3.4	Dielectric studies	131
6.4	Conclusion	137
7	SUMMARY AND FUTURE SCOPE	138-142
7.1	Summary	138
7.2	Suggestions for future work	141
	REFERENCES	143
	APPENDICES	
	i) LIST OF PUBLICATIONS	
	ii) REPRINT OF JOURNAL PUBLICATION	
	iii) BIO-DATA	