

Contents

Certificate Declaration by the Candidate.....	iii
Certificate by the supervisor.....	v
Copyright Transfer Certificate.....	vii
Acknowledgement.....	ix
Contents.....	xiii
List of Figure and Table.....	xviii
Preface.....	x
Chapter 1: Introduction.....	25 - 46
1.1 Magnetism: an introduction	27
1.1.1 Diamagnetism	27
1.1.2 Para magnetism	28
1.1.3 Ferromagnetism	29
1.1.4 Anti-ferromagnetism and ferrimagnetism.....	29
1.2. Rules define the different types of magnetic ordering.....	30
1.2.1 Curie-Weiss law.....	30
1.2.2 Landau's theory for ferromagnetism (mean field theory).....	31
1.3 perovskite material.....	32
1.3.1 Single perovskite material.....	32
1.3.2 Double perovskite material.....	32
1.4 correlation between electronic structure and magnetism.....	34
1.5 literature survey on double perovskite materials.....	35
1.5.1 R_2CoMnO_6 double perovskite.....	35
1.5.2 A_2CoFeO_6 type Double Perovskite.....	37
1.5.2.1 La_2CoFeO_6 System.....	37
1.5.2.2 Pr_2CoFeO_6 System	38
1.6 Some important physical phenomena related to our research.....	38
1.6.1 Griffiths phase.....	38
1.6.2 Meta-magnetic transition	39
1.6.3 Exchange bias	40
1.6.4 Spin-glass.....	42
1.6.5 Dielectric properties.....	43
1.7 Motivations of the thesis	44
Chapter 2: Experimental Section.....	47- 57
2.1 Sample preparation	49
2.1.1 Solid state reaction route	49
2.2 Experimental characterization techniques.....	50
2.2.1 X-ray diffraction measurement	50
2.2.3: X-ray Photoemission Spectroscopy (XPS) technique.....	52

2.2.4 Raman spectroscopy.....	53
2.2.5 Magnetization study and MPMS	56
Chapter 3: Coexistence of large dielectric constant and strong meta-magnetic state in Eu_2CoMnO_6.....	59 - 76
3.1 Introduction.....	61
3.2 Experimental details.....	62
3.3 Results and discussions.....	63
3.1.1 X-ray diffraction study.....	63
3.1.2 X-ray absorption spectroscopy study.....	64
3.1.3 Resistivity measurement	66
3.1.4 Dielectric measurement.....	68
3.1.5 Impedance measurement and Cole-Cole plot.....	70
3.1.6 Magnetic study.....	72
3.4 Conclusion	75
Chapter 4: Observation of the multiple magnetic phases in double perovskite $Pr_{1.8}La_{0.2}CoFeO_6$.....	77-102
4.1 Introduction.....	79
4.2 Experimental Characterization.....	81
4.3 Results and discussions.....	82
4.3.1 X-ray diffraction study	82
4.3.2 X-ray photoemission spectroscopy study.....	84
4.3.3 Magnetometer measurement.....	86
4.3.3.1 D C magnetization study.....	86
4.3.3.2 A C magnetization study.....	90
4.3.3.3 Field-dependent Magnetization Study.....	92
4.3.3.4 Exchange Bias Effect.....	95
4.3.4 Raman spectroscopy.....	97
4.4 Conclusion	102
Chapter 5: Observation of Magnetic and electrical properties of $Y_{1.5}Ca_{0.5}CoMnO_6$	103-121
.....	
5.1 Introduction.....	105
5.2 Experimental.....	
5.3 Results and discussions.....	107
5.3.1 Structural analysis.....	107
5.3.2 X-ray Photoemission Spectroscopy Study.....	108
5.3.3 Resistivity study.....	110

5.3.4	Magnetic study.....	113
5.3.5	DC Susceptibility.....	116
5.3.6	Field-dependent Magnetization.....	118
5.4	Conclusion	120
Chapter 6: Notable Meta-magnetism behavior in double perovskite material		
$Y_{2-x}Ca_xCoMnO_6$ (x = 0.10, 0.20).....		123 - 138
6.1	Introduction.....	125
6.2	Experimental.....	127
6.3	Results and discussions.....	127
6.3.1	Structural analysis.....	127
6.3.2	X-ray Photoemission Spectroscopy Study.....	130
6.3.3	Resistivity study.....	132
6.3.4	Temperature Depends Magnetization Study.....	134
6.3.5	DC susceptibility.....	136
6.3.6	Magnetic hysteresis study.....	137
6.4	Conclusion.....	138
Chapter 7: conclusions and plan.....139-143		
7.1	conclusion.....	141
References.....		145-181
List of publications.....		182
Workshops/Conferences attended.....		183