

INDEX

1. Introduction and Theoretical consideration	
1.1 Introduction	
1.1.1 Dilute magnetic alloys	
1.2 Theoretical consideration	
1.2.1 Dipole interactions,	7
1.2.2 Spin Interactions	7
1.2.3 Heisenberg exchange interactions	8
1.2.4 Superexchange interactions	8
1.2.5 Double exchange interactions	9
1.2.6 Indirect exchange interactions	10
1.2.7 Disordered Magnetic systems	12
1.2.8 Hyperfine interactions in magnetic materials	13
1.3 Mossbauer parameters	15
1.3.1 Magnetic hyperfine splitting	15
1.3.2 Isomer shift	16
1.3.3 Second Order Doppler shift	20
1.3.4 Electric Quadrupole Splitting	21
1.4. Electric Field Gradients in Solids	25
1.5. Theory of defects in metals	27
1.5.1 Defects in metals	27
1.5.2 Method of defect production	27
1.5.3 Annealing procedure for the removal of defects	28
1.5.4 Identification of defects in materials	29
References	31
2. Experimental Techniques	
2.1 Introduction	36
2.2 Mossbauer Spectroscopy	36
2.2.1 Mossbauer source and absorber	38
2.2.2 Drive unit	40
2.2.3 Gamma ray detector and data acquisition system	40
2.2.4 Data Analysis	41
2.2.5 Velocity Calibration	43
2.3 Time Differential Perturbed Angular Correlation technique	43
2.3.1 Experimental Setup	43
2.3.2 Data Reduction and Error Analysis	46
2.3.3 Time Calibration of TDPAC spectrometer	47
2.4 AC Susceptibility	48
2.4.1 Introduction	48
2.4.2 Basic Principles	49
2.5 Hall Effect	51
2.5.1 Introduction	51
2.5.2 Importance of hall effect	52
2.5.3 Magnetoresistance	53
References	54



3. Hyperfine interaction studies in dilute magnetic semiconductor Fe-Sb-Se	
3.1 Introduction	56
3.2 Sample Preparation	58
3.3 Experimental Results	59
3.3.1 Mossbauer measurements	59
3.3.2 Hall Measurements	74
3.3.3 X-Ray diffraction studies	76
3.3.4 Magnetoresistance measurements	79
3.3.5 A.C.Susceptibility measurements	83
3.4 Summary	85
References	86
4. Temperature variation of EFG in Sb₂Se₃	
4.1 Introduction	89
4.2 Experimental Details	90
References	99
5. Hyperfine interactions studies of Radiation induced defects in cubic Rh metal	
5.1 Introduction	101
5.2 Experimental Details	102
5.2.1 Target details	102
5.2.2 Irradiation Details	103
5.2.3 Offline study	104
5.3 Results and Discussion	106
5.4 Conclusion	112
References	113
6. Summary and Future Scope	
Summary	115
Future Scope	119