

Contents

Chapter 1 Introduction	4
1.1 Motivation.....	5
1.2 Scope of this thesis.....	6
1.3 References.....	9
Chapter 2 Materials and physical phenomena	12
2.1 SrRuO ₃	13
2.1.1 Structural Properties.....	13
2.1.2 Magnetic Properties	13
2.1.2.1 Magnetic anisotropy.....	14
2.1.2.2 Magnetic interlayer coupling	16
2.1.3 Magnetotransport	21
2.1.3.1 Magnetoresistance.....	21
2.1.3.2 AHE.....	21
2.2 SrTiO ₃ substrate	25
2.3 SrIrO ₃	26
2.3.1 Introduction to SrIrO ₃	26
2.3.2 Crystal structure properties	27
2.3.3 Conductivity and Magnetic properties	27
2.4 LaNiO ₃	28
2.5 Magneto-optic Kerr effect.....	29
2.5.1 Introduction to MOKE	29
2.5.2 Polarization of light.....	30
2.5.3 Definition of the magneto-optical Kerr effect	31
2.5.4 Physical origin.....	33
2.5.5 Geometries of Kerr effect.....	34
2.5.6 Measurement theory.....	34
2.5.6.1 Intensity modulation.....	35
2.5.7 Calibration of the Kerr rotation	39
2.5.8 The Kerr spectroscopy of SrRuO ₃	40
2.6 References.....	43
Chapter 3 Experimental methods	49
3.1 Film growth.....	50
3.1.1 Pulsed Laser Deposition.....	50
3.1.2 Reflection high-energy electron diffraction (RHEED)	51
3.2 Magneto-optical Kerr effect (MOKE) and magneto-transport measurements	52
3.2.1 MOKE measurements	52
3.2.2 Magneto-transport measurement.....	54
3.3 Atomic Force Microscopy (AFM)	56
3.4 Superconducting Quantum Interference Device (SQUID) magnetometer.....	57
3.5 X-Ray Magnetic Circular Dichroism (XMCD).....	58

3.6 References.....	61
Chapter 4 Origin of the hump anomalies in the Hall resistance loops of ultrathin SrRuO₃/SrIrO₃ multilayers.....	63
4.1 Abstract	65
4.2 Introduction.....	65
4.3 Method	67
4.3.1 Sample growth	67
4.3.2 Sample characterization	67
4.4 Results and discussion	68
4.4.1 Microstructure investigations.....	68
4.4.2 Magnetic properties.....	71
4.4.3 Anomalous Hall resistance and MOKE hysteresis loops	76
4.5 Summary	82
4.6 References.....	84
Chapter 5 Enhancing the ferromagnetic interlayer coupling between epitaxial SrRuO₃ layers	88
5.1 Abstract	90
5.2 Introduction.....	90
5.3 Experiment details.....	91
5.4 Results and discussion	93
5.4.1 Microstructure investigations.....	93
5.4.2 Magnetic interlayer coupling	96
5.4.3 Resistivity measurements of bare LaNiO ₃ thin films deposited on SrTiO ₃ (100).103	
5.4.4 Hall effect resistance loops	105
5.5 Summary	106
5.6 References.....	108
Chapter 6 Tailoring the magnetic anisotropy of SrRuO₃ layers by epitaxial interfacing with LaNiO₃ multilayers.....	110
6.1 Abstract	112
6.2 Introduction.....	112
6.3 Experimental details.....	114
6.4 Results and discussion	115
6.4.1 Investigation of microstructure	115
6.4.2 Magnetic anisotropy	116
6.4.3 Anomalous Hall effect (AHE) resistance and Kerr rotation.....	118
6.5 Conclusion	121
6.6 References.....	123
Chapter 7 Summary and Outlook.....	127
7.1 Summary and Outlook	128
7.2 References.....	131
List of figures.....	132
List of tables	141
List of abbreviations	142
Acknowledgments.....	144

Publications and posters	147
---------------------------------------	------------