
Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 1 |
| 2 | Fundamentals | 7 |
| 2.1 | Ferromagnetism of 3d transition metals | 7 |
| 2.2 | Anisotropy | 9 |
| 2.3 | Coupling of Ferromagnetic Films | 12 |
| 2.4 | Magnetic domains | 18 |
| 2.5 | Magnetization dynamics | 20 |
| 3 | Experimental methods | 25 |
| 3.1 | X – Generation of X-rays | 25 |
| 3.2 | XMCD – X-ray Magnetic Circular Dichroism | 27 |
| 3.3 | PEEM – Photoemission Electron Microscopy | 30 |
| 3.4 | Time-Resolved PEEM of magnetization dynamics | 33 |
| 4 | Methodical developments | 35 |
| 4.1 | Experimental setup | 35 |
| 4.2 | Generation of magnetic fields pulses | 37 |
| 4.3 | Deflection gating | 39 |
| 4.4 | Accessing buried interfaces | 43 |
| 4.5 | Summary of the methodical developments | 47 |
| 5 | Domain structure in magnetic heterostructures | 49 |
| 5.1 | Dual-Heusler systems | 49 |
| 5.2 | Epitaxial systems | 58 |
| 5.3 | Summary of the magnetostatic results | 65 |
| 6 | Magnetization dynamics in single films | 67 |
| 6.1 | Magnetically soft and isotropic permalloy | 67 |
| 6.2 | Iron films with magnetocrystalline anisotropy | 70 |
| 6.3 | Summary of the single layer experiments | 74 |

| | |
|--|------------|
| 7 Magnetization dynamics in heterostructures | 77 |
| 7.1 Domain wall motion in Fe/Cr/Co | 77 |
| 7.2 Coherent rotation and domain wall motion in CoFe/Cr/NiFe | 84 |
| 7.3 Excitation of precessional eigenmodes | 90 |
| 7.4 Resonant excitation | 94 |
| 7.5 Summary of the layer-resolved magnetization dynamics | 96 |
| 8 Conclusions & Outlook | 99 |
| Bibliography | 105 |
| Publications | 119 |